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HANDLING ▪ CRUSHING ▪ SCREENING ▪ WASHING


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## Steam Shovel Chain

September, 1924



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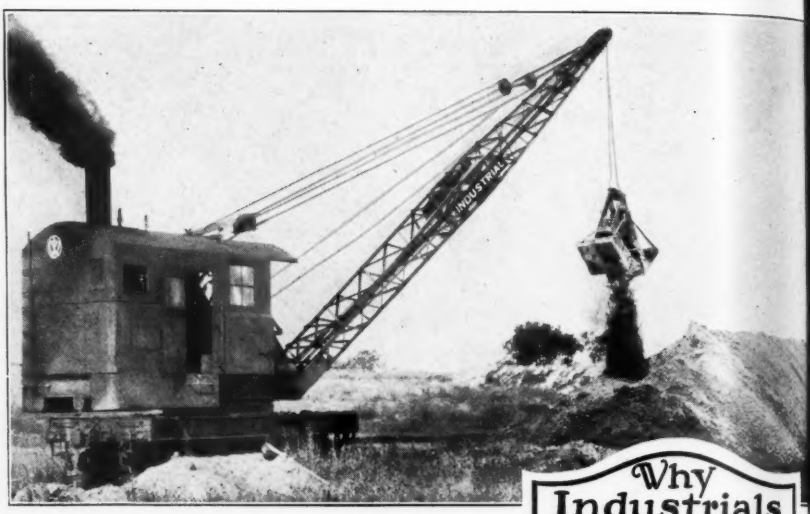


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# INDUSTRIAL
## CRAWLING TRACTOR CRANES

# Pit and Quarry

*A Monthly Publication for Producers and Manufacturers of Sand, Gravel, Stone, Cement, Gypsum, Lime and Other Non-Metallic Minerals*

VOL. 8 CHICAGO, ILL., SEPTEMBER, 1924 NO. 12


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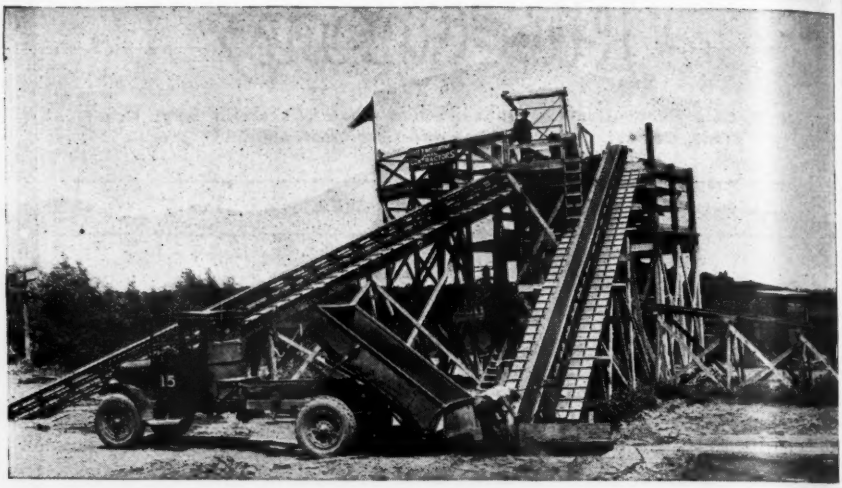

# A permanent conveyor

## *built up from standardized sections*

**In 1920, the Henry W. Horst Company bought two 39-foot Barber-Greene Portable Conveyors for handling sacked cement.**

**Conditions in 1921 demanded that these be lengthened to 72 feet. Barber-Greene standard intermediate sections were added, both machines being turned into permanent conveyors which were used to load bins with sand and gravel. Later, one of them was put to carrying bulk cement to a proportioning bin above the mixer.**

**Commenting on the performance of this machine, Mr. R. Peterson, engineer of the Horst Company, said: "The amount of material handled per day varied, of course, but was on an average of 400 barrels of cement. However, we can readily state that at no time was the capacity of the conveyor fully utilized."**

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**Catalog N will help you to analyze your own material-handling needs. It will show you how Barber-Greene conveying methods can greatly quicken your production at a decided reduction in costs. Send for it now.**

**Barber-Greene Company**
**490 W. Park Avenue, Aurora, Illinois**

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**BARBER GREENE**

**Portable Belt Conveyors — Self Feeding Bucket Loaders**

**Coal Loaders . . Automatic — Ditch Diggers . . Coal Feeders**

Pit and Quarry

Vol. 8 Chicago, Ill., September, 1924 No. 12

# Scientific Cooperation

A FINE spirit of mutual helpfulness among producers seems to be displacing the old attitude of selfish, suspicious, aloofness. The theory that is ensuring wide-spread success is that wholesome competition is beneficial and indicative of general prosperity; that competition and cooperation are compatible each stimulating the other; and that such cooperation has a sound economic foundation.

The producer who is operating on the principle of the old "Keep Out" sign is losing more than he gains. He is barring the other fellow from beneficial cooperation, and at the same time he is depriving himself of advantages. The chances are that he has nothing of value to hide and that his "Keep Out" attitude is sheer bravado.

The producers who are changing that sign to the cordial and up-to-date slogan, "Come In," are the ones who have something worth while to give. They will not only benefit themselves but will aid the entire industry. The value of an exchange of ideas with a competitor far exceeds any value derived from a policy of reserve.

As far as the product is concerned, each one will make the best one possible. That is the key to his success. He has no cause to fear competition. He needs competition to stimulate the industry and to enliven the market. Business is the greatest field of human activity. Competition is the impelling force which ensures the preservation of individual initiative. Fair competition enables the producer to realize success through efficiency and not by artificial factors.

We can have cooperative organization of industry without injuring competition. Preservation of the competitive system depends upon the ability of business men to solve their problems through collective action. Hence, competition and cooperation are being put on a sound scientific basis through trade associations. When we find producers coming together from all sections of the country for the purpose of studying conditions, comparing results, and exchanging ideas for their mutual benefit, we can foresee untold possibilities for future development. When two rival producers, deadly foes in the business game, meet for a battle on the golf course and later come together at the convention banquet, there is sure to follow a solution of some of the problems with which they are both concerned. These two rivals go back home, once more enemies in the production game, but the enmity bears no bitterness and they have contributed their part in the general broadcasting of the spirit of scientific cooperation which is increasing with every such meeting. Trade associations thus strengthen business ideals, lessen the wasteful frictions of trade, solve the knotty problem of production and distribution, and are a potent element of economy.

There are many wastes in our system of competition which may be lessened through the work of trade associations. Unnecessary plant duplication results in a producing capacity in excess of demand. This may be regulated through a better understanding of the situation. Lack of knowledge of the vital facts concerning industry may cause unstable production, unsteady labor conditions, and abnormal price fluctuations. Lack of knowledge of costs, absence of recognized standards of operation, failure to develop the uses of the product completely and to use the by-products, all result in waste and are detrimental to industry. These, however, are the very problems which will inevitably be solved as producers continue to combine their knowledge in their endeavors to understand them. They will reduce the economic wastes of competition while they retain all of the benefits which are essential to the future of business.

Industry must have a code of ethics,

a standard of fair practices. Such a code comes from trade associations. They determine a fair and honorable way of handling business problems. They have almost unlimited opportunity to bring about clean, fair commercial conditions. They will increase the general knowledge of costs and accounting methods; they will effect standardization; they will encourage effort to maintain harmonious relations between capital and labor; and they will work toward a solution of the problem of economic waste.

## Semi-Monthly to Begin With New Volume

THIS number of PIT and QUARRY completes Volume 8. It marks a year of achievement and constant growth. Retrospection is a pleasure but, in greater degree, there is inspiration in anticipation. Therefore, with great enthusiasm we turn from the past to contemplation of the future. Volume 9, which commences with the October 1st number, will justify, we hope, every expectation that growth of preceding volumes might suggest. In volume 9, we shall endeavor to give our readers unexcelled news and editorial service.

—Editor.

## *The Pittsburg Plus Case*

A SALIENT feature of the controversy in the Pittsburg plus case is the fact that the Federal Trade Commission has no power to enforce its cease and desist order. It has a certain moral force, however, in that it is a creation of the Government, and is not likely to be ignored by the Steel Corporation. The lack of jurisdiction on the part of the Commission has been considered by Congress and by the Commission itself. The effort to give the Commission the power to enforce its decisions was unsuccessful. The Federal Trade Commission can do no more than go before a court of appeals if its decision is ignored and ask that the Steel Corporation be forced to show why it is not guilty of contempt.

The ruling of the Commission in the Pittsburg plus case was based on the section of the Federal Trade Commission Act which deals with unfair methods of competition, and on the Clayton Act dealing with price discrimination. The cause for dispute lies in the interpretation of the phrase, "unfair methods of competition." A Supreme Court decision in another controversy maintained that the words are not defined by statute and do not apply to dealings which do not violate recognized standards of business ethics and do not hinder competition. In applying the law relative to unfair competition the Federal Trade Commission is limited to practices which have already been established by statute as unfair.

The Commission claims that it is attempting to prevent the Steel Corporation from alleged price discrimination. This is covered by Section 2 of the Clayton Act. The law carries provisions that discrimination shall not be unlawful if made because of differences in the cost of selling, because of differences in the grade, or if made in good faith to meet competition. These provisions are recognized by the Commission in its order issued to the Steel Corporation.

The opinion of Judge Brandeis on this case is that the Commission should be allowed to develop the law of unfair competition and to prevent unfair business methods. The law was intended to deal with present day business practices and to bring the Commission close to business problems. The Commission has, however, been defeated in the courts in a number of cases in which its ruling has been contested. Court decisions tend to refrain from interference with individual enterprise. In its endeavor to develop a law of unfair competition, the Commission will find its efforts somewhat futile until it secures a more clearly defined authority as a basis for its decisions. In its present status it has no power to inflict a penalty or in any way to enforce its orders.

In the Pittsburg base matter there will probably be no tendency on the part of the Steel Corporation to disregard the ruling of the Commission. The statement of Judge Gary, that "there never should be any reason for government action to compel us to do what is right," indicates an amicable outcome of the controversy. The belief that all prices are quoted on a uniform price at Pittsburgh is erroneous.

# Cement Block and Gravel Business Successfully Combined

## A. J. Clementz' Sons Find Ready Market for Product Cement Block Affords Appreciable Outlet for Sand

THE manufacture of cement products in conjunction with sand and gravel plants is becoming more and more common throughout the country. A large number of the crushed stone plants are also absorbing their screenings through the manufacture of cement products. The unusual activity in building operations during the last few years has brought about a shortage of brick. Many producers saw in this condition an opportunity to utilize what to some had been a waste product. Cement products find a ready market and bring a good return. A quality product and sales effort are necessary to successfully satisfy the market. The merits of cement block have been established. Practically all of the larger cities have adopted ordinances specifying the standards for cement block. These ordinances assure the consumers of a block that will give the desired service. Cement block if made properly can compete with any other building brick or block. The facings in the cement block can be made in great variety. The strongest points in favor of cement blocks are their quality and economy.

Practically half of the building construction in this country is residential construction. Up to the time of the recent war probably 90 per cent of all home construction was of the combustible type while today a permanent structure is demanded. The total equivalent of concrete building units produced last year was equal to five billion common clay brick while the common clay brick production itself only reached six billion.

The increased efficiency and production of concrete or cement block manufacturers and a more general appreciation of the longer life, low upkeep, low insurance, cost, etc., will develop an industry of great magnitude.

### The Gravel Plant

A. J. Clementz' Sons have a deposit

Gravel Deposit, Conveyor and Crusher House.

Bin Construction Which Is 55 Feet High.

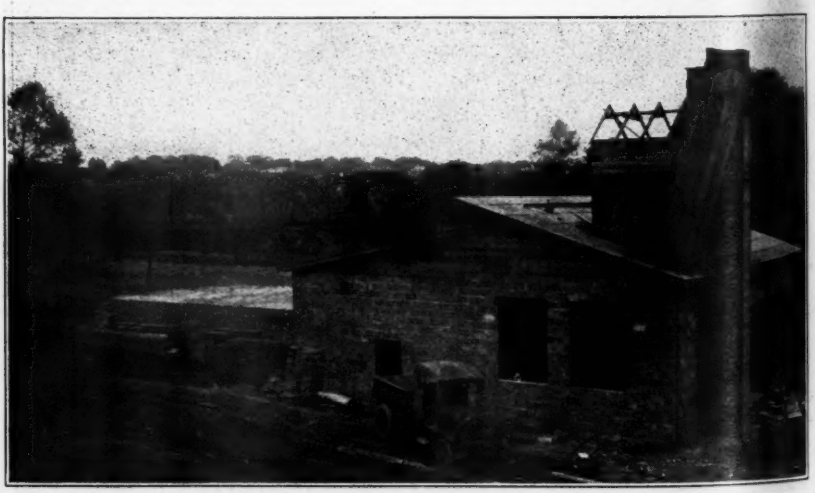
at Massillon, Ohio, running about 50 per cent sand and 50 per cent gravel, about 125 feet in depth. At this time a Thew Model O Steam Shovel is working a 65 foot bank loading into a hopper. From the hopper the material is fed onto a 24-inch 6 ply Goodrich Belt by means of a reciprocating feeder. A 7½ H. P. General Electric Motor drives the belt and feeder. This hopper and belt can easily be moved to any position convenient for loading the material from the steam shovel.

The material is delivered by the conveyor belt to a dry screen of 1¾-inch mesh and screened. The large material runs into a No. 5 Traylor Gyratory Crusher and is reduced down to 1¾ inch. The crusher discharges from the side so as to make it easy to repair the crusher from the bottom or top. The crusher sets on concrete piers 6 feet off the concrete floor making it easy to work under the crusher without disconnecting the belt. Many of the small plants have the belt running directly under the crusher and dry screen.

Both the material from the screen and the discharge from the crusher are conveyed by the belt conveyor to a Telsmith 42x14 inch washing screen. This belt runs on Stephens-Adamson Ball Bearing Conveyor Carriers. The material is washed and screened in the Telsmith screen and four sizes produced—a sharp sand, a ⅜ inch concrete sand, a 1 inch pea gravel and a 1¾ inch stone.

Water for washing purposes is pumped from a well 125 feet deep about 600 feet from the bins by a 40 H. P. 6 inch Weiman Electric Centrifugal Pump at the rate of 600 g.p.m. The water is sprayed upon the gravel by three pipe lines each 7 feet long and ⅛ inch in diameter. From the screen the stone is dropped into one bin, the pea gravel into another and all the sand is run through two large Telsmith settling tanks. These tanks operate automatically and insure clean material at all times.

There are four bins each with a capacity of 166 cubic yards. They are set on reinforced concrete pillars



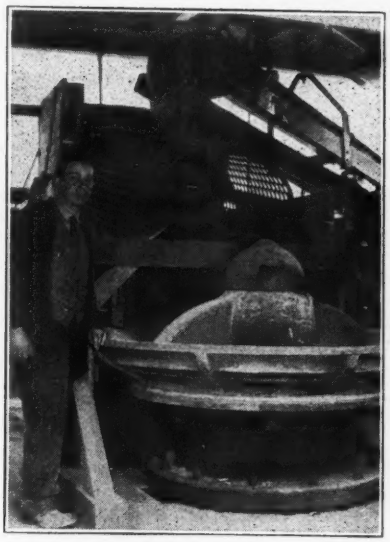
Exterior View of Cement Block Plant.

and piers. The upper part of the bins is made of oak wood and reinforced with 1⅛-inch steel rods running both ways.

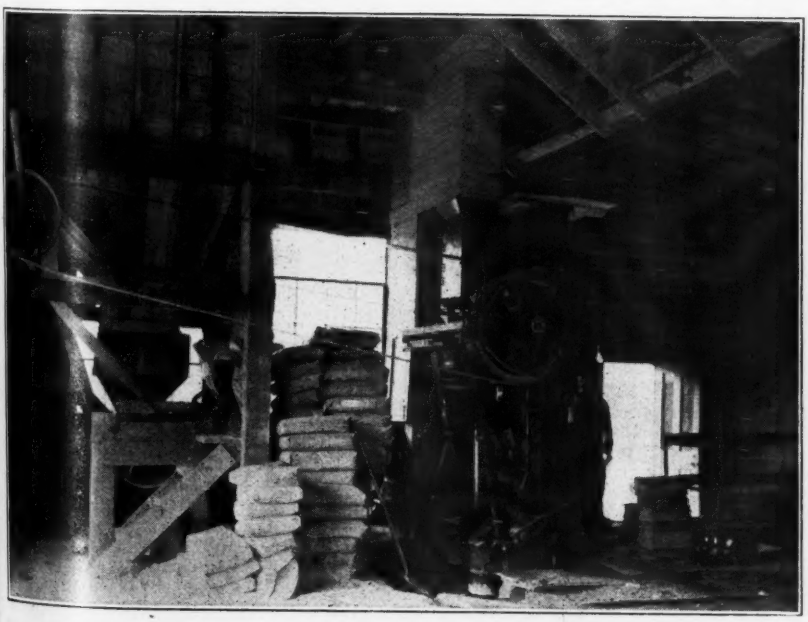
The entire plant is operated with about 125 H. P. obtained from the Ohio Public Service Company and entirely controlled by one man from the crusher house. An electric signal is placed at various parts of the plant for each unit operated. The feeders and dry screen were made by Mr. E. E. Clementz who is superintendent as well as vice-president of the company. The capacity of the plant is 700 cubic yards a day. The plant is located between the Baltimore and Ohio and the Western Lake Erie Railways so a switch will be built next year.

### The Cement Block Plant

A modern, up-to-date plant for manufacturing concrete blocks is operated in conjunction with the gravel plant. This plant is located about fifty feet from the gravel washing plant. A concrete hopper is located outside the block plant, into which the material is dumped directly from the trucks. In the bottom of this hopper is a Kent automatic elevator feeder, which feeds the sand into a bucket elevator which lifts it about forty feet and dumps it into a bin located directly over the mixer, inside the building. This bin holds about 30 cu. yds. and from here the material feeds by gravity directly into the sand hopper of the Kent Mixer. A separate hopper is provided for the cement and is located directly over the cement hopper of



Interior View of Crusher Building.



Interior View of Block Plant Showing Mixer and Block Machine.

the mixer. The Kent Mixer automatically proportions and measures both cement and sand and feeds these materials into the mixing trough, where it is very thoroughly and uniformly mixed. The mixed concrete is automatically discharged from the mixer into a special design of bucket elevator which delivers it to the hopper on the Post Block Machine. In the bottom of this hopper is an automatic measuring device which, at every revolution of the machine, measures out just the required amount of concrete for the next block. This material is automatically discharged into the mold box of the machine when the pallet is placed in position. The operator then throws in the clutch and the block is formed and stripped from the mold box at one revolution of the machine. About three seconds is required to form and strip the block. The production of this machine is about 2,000—8x8x16" blocks in eight hours. From a labor standpoint the plant is very economical in operation, because labor saving equipment is used throughout. It will be noted that the material is handled entirely by machinery, from the time it is taken from the gravel plant until the finished block is removed from the machine. An arrangement of this kind is made possible by the use of the automatic elevator feeder, bucket elevator, Kent Mixer and the automatic Post Economy Punch Block Machine. This equipment was furnished by The Kent Machine Company, Kent, Ohio. This same concern also cooperated with Mr. E. E. Clementz in designing and arranging the equipment in the plant.

The method of getting the blocks away from the block machine to the curing tunnels is very important. It is necessary that the blocks be handled carefully so that the corners of the green blocks are not broken. At this plant the blocks are taken from the machine and loaded on Chase Roller Bearing Rock Cars and moved into concrete tunnels. These cars have three decks giving a capacity of 54 blocks per car. The blocks are steam cured in the concrete tunnels of which there are three each, 7 feet wide and 60 feet long. A small concrete gutter is made between two rows of cars in the tunnel and a 2 inch pipe which is full of ⅛ inch holes is laid in this gutter. Live steam is forced through this pipe curing the blocks in about 24 hours. The Chase Rock Car is manufactured by the Chase Foundry and Manufacturing Company of Columbus, Ohio.

The blocks after curing are taken from the cars and stored in the yard or loaded on trucks and delivered on the job. A 40 h.p. boiler is used for making the steam and steam can be used winter and summer.

An Ideal Block Machine is also used for making 8x8x16 inch rock face blocks. The Kent Mixer provides enough concrete for both the Ideal and Post Block Machines. The entire block paint is operated by a 20 H. P. General Electric Motor. The Ideal Block Machine is manufactured by the Ideal Concrete Machinery Company of Cincinnati, Ohio.

The cement block side of this plant has proven such a profitable investment that an addition to the plant will be built shortly. The A. J. Clementz' Sons have developed an attractive block business. Their success is largely due to their determination to produce a quality product. W. G. Clementz is president and E. E. Clementz vice-president and superintendent. The plant design and some of the equipment represent the endeavors of E. E. Clementz.

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**Cement Products Output Increasing**

A really remarkable increase in the use of cement products is indicated by the production figures of the last four years. The annual output of cement block and tile during the last four years was as follows:

1920 ..... 50,000,000 units
1921 .....175,000,000 units
1922 .....297,000,000 units
1923 .....385,000,000 units

This shows an increase of 670 per cent in four years. The manufacture of cement products has grown to a great national industry. This industry is in a sense localized as the blocks, tile, etc., are rarely shipped over 200 miles.

The average cement block is 8x8x16 inches, having 20 to 40 per cent air space, while cement tile has from 50 to 75 per cent air space. A much greater variety of design is offered in the tile than in the block. The common size of tile is 5x8x12 inches.

The blocks are made with one, two, three, four and five cells for walls eight, ten and twelve inches thick. They range in size from 3 to 11¾ inches in height, from 3¾ to 24 inches in width and from 7¾ to 24 inches in length.

# Combustion and Powdered Coal

Written Expressly for Pit and Quarry by Charles Longenecker*

NOTABLE always, especially in America, is the ever increasing demand for economy in our mechanical and metallurgical processes. This presages a healthy condition. Were this demand lacking, it would indicate stagnation. The demand for economy may be a stern demand or it may arise from a selfish motive depending on whether it is forced by keen competition or by a desire for larger dividends. From whatever source it arises, it is the impelling force from which springs the majority of the advances in our various methods of manufacture.

Every line of manufacture requires the burning of fuel at some stage, and it is therefore only natural that there should be a continual striving to obtain greater economy in our consumption of fuel. When we realize that the efficiencies of our industrial furnaces average in the majority of cases from 5% to 10% we can appreciate the great waste of heat. Even with the realization that we are most prodigal with our fuels, we affect a certain smugness in the fact that our geological surveys show resources in oil, coal, and gas which will supply our needs for years to come. Unfortunately these surveys do not indicate the fact that the best of our oil and coal is being rapidly exhausted. In the near future it will be quality and not quantity we shall lack. This condition then will place an additional burden on the manufacturing industries. Financial considerations today dominate the industrial field and will continue to do so. There will be very little heed given to fuel conservation until high costs force the issue.

Undoubtedly one of the greatest steps to promote higher efficiencies in our furnaces has been the adoption, at many plants, of powdered coal as a fuel. Probably the first question to be raised will be what benefit is derived by powdering coal? The answer to this is that coal when powdered can be burned in close adherence to the elemental laws of combustion. These laws demand, for the highest efficiency, that there be provided conditions such that the fuel, whether it be gas, liquid or solid, be put in such a state that the union of the hydrogen and carbon of the fuel with the oxygen of the air will be most readily and quickly accomplished. It is apparent that coal, when pulverized, can be mixed with air more readily then when in the form of lumps. The lumps of coal burn from the outside towards the center, and the burning necessitates a comparatively large amount of air. This presents the second reason for powdering coal. It is that a far smaller amount of air is required for combustion and hence the heat of the coal is more concentrated and raises the air to a higher temperature. This is illustrated by comparing "hand-firing" with "powdered coal firing." In the first instance for every pound of coal 250 cubic feet of air may be required while in the latter case only 150 cubic feet will be necessary. The heat in the one pound of coal will in the one case be absorbed by 250 cubic feet of air and in the other case by 150 cubic feet. Naturally the temperature of the smaller amount of air will be higher.

The powdered coal will possess no properties not inherent in the original lump other than the change of form. It is simply the change of form that gives it added value. This change of form, aside from promoting combustion, presents other desirable features. The fine coal is easy to transport. It can be forced through pipes in a manner similar to a liquid. This distribution is done at a low cost. When in a fine state, coals of inferior grades can be burned to greater advantage. This fact will undoubtedly be more appreciated when our high quality gaseous coals are not so easily secured.

Coals possessing a wide divergence in analysis are being burned today and with excellent results. The variation is from the lignitic coals of the West to the anthracite coals of the East. The coals most preferred are those containing a fairly high content of volatile matter. Low ash is desirable but high ash coals burn practically as well. A coal of high ash content, with high "point of

*Engineer, Combustion Engineering Corporation.

fusion" is more desirable than a low ash coal with low fusing temperature. In boiler furnaces all troubles from the ash have been eliminated by the introduction of a device termed a "water screen." This consists of a screen made of pipes through which water circulates. It is placed near the furnace bottom and in a position such that the ash falls between the pipes, and being cooled the ash is deposited in a granular state and is easily removed.

Anthracite coals do not ignite as quickly as gaseous bituminous coals and hence require a design of furnace such that ignition will be more easily effected and maintained. Anthracite coal has not been burned with success in any furnaces other than under boilers.

The fineness to which coal is pulverized depends largely upon the type of furnace in which it is to be burned. Thus if burned under a boiler where the flame travel is long, it can be coarser than the standard which is 95% through a 100 mesh screen. For Open Hearth steel and Malleable iron melting it should be finer than that mentioned above. For most other types of furnaces the most economical results are secured when the fineness adheres to the standard. The cost of pulverized coal increases with the fineness. Hence it is not economical to make the coal finer than necessary for the particular operation.

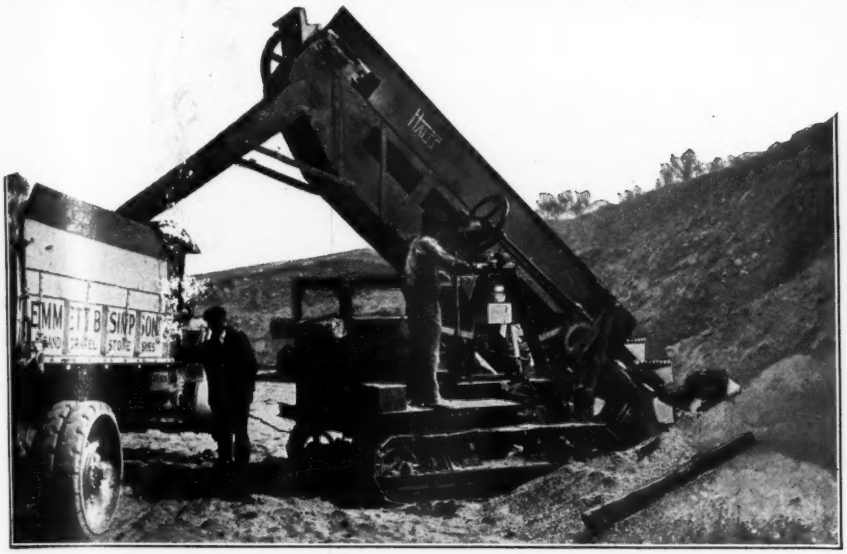
The equipment needed to carry out the process for powdering and distributing to the burners can be divided into two systems which will be termed the "Central Station" and the "Unit" System. In the "Central Station System" the coal is first crushed in a standard double, or a single roll crusher. The surface moisture is then removed by passing the coal through a dryer of which there are several types. From the dryer the coal goes into the pulverizer. This piece of equipment consists of rolls revolving at a high speed so that centrifugal action forces them against an outer steel ring. The coal is caught between the rolls and the ring and powdered. The fine coal is then carried away from the pulverizer and deposited in a bin from which it is transported to hoppers located near the furnaces. From these hoppers a feeding device drops the coal into a stream of air which in turn floats it to the burners. At the burners additional air is provided as required for complete combustion.

The "Unit System" derives its name from the fact that one unit of equipment serves each individual furnace. It is comparable to the stoker in that each furnace is fired by one stoker. The Unit machine is no more than a pulverizer with a fan connection. Coal is fed into the machine and pulverized and then it is drawn by suction into a fan which discharges it to the burner and into the furnace. In this type of equipment there is no drying. It is inexpensive as compared with the Central System but its application is limited to single furnaces of fairly large capacity as regards fuel consumption.

The field for powdered coal has broadened very materially of late years. For many years the use of this fuel was confined to cement kiln firing. It then found a place in the industrial furnace heating. Today the most fertile field is for the creation of steam in our power plants. The steps have not been rapid or easy, as very extensive and costly pioneering work marked each forward movement. This is especially true in adapting powdered coal to the firing of boilers as accomplished in large city power stations.

As to the future there are indeed very bright prospects. New inventions and improvements will undoubtedly open up fields as yet untouched. At the present time the melting of malleable iron with powdered coal is a most attractive development as it has made a very material saving for the manufacturers who have adopted the fuel.

The desire of every manufacturer is to obtain his ultimate product, whether it be brass, steel or steam, at the lowest cost per unit of output. There has been quite a little misconception as to the means for accomplishing this desirable end as regards fuel. The cheapest fuel is not always the most economical. Fuel cost is just one item in the heat balance. A high priced coal with low ash, low sulphur, and a high ash fusing point very frequently is more economical than a coal of an opposite composition which can be purchased at a lower figure. Another factor of equal importance is the efficiency with which a fuel is burned. In other words, the actual burning of the fuel is as important, if not more so, than the fuel itself.



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Plymouth Gasoline Locomotive at the New, Plant o

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THE FATE-ROOT-HEATH CO. (Plym moti

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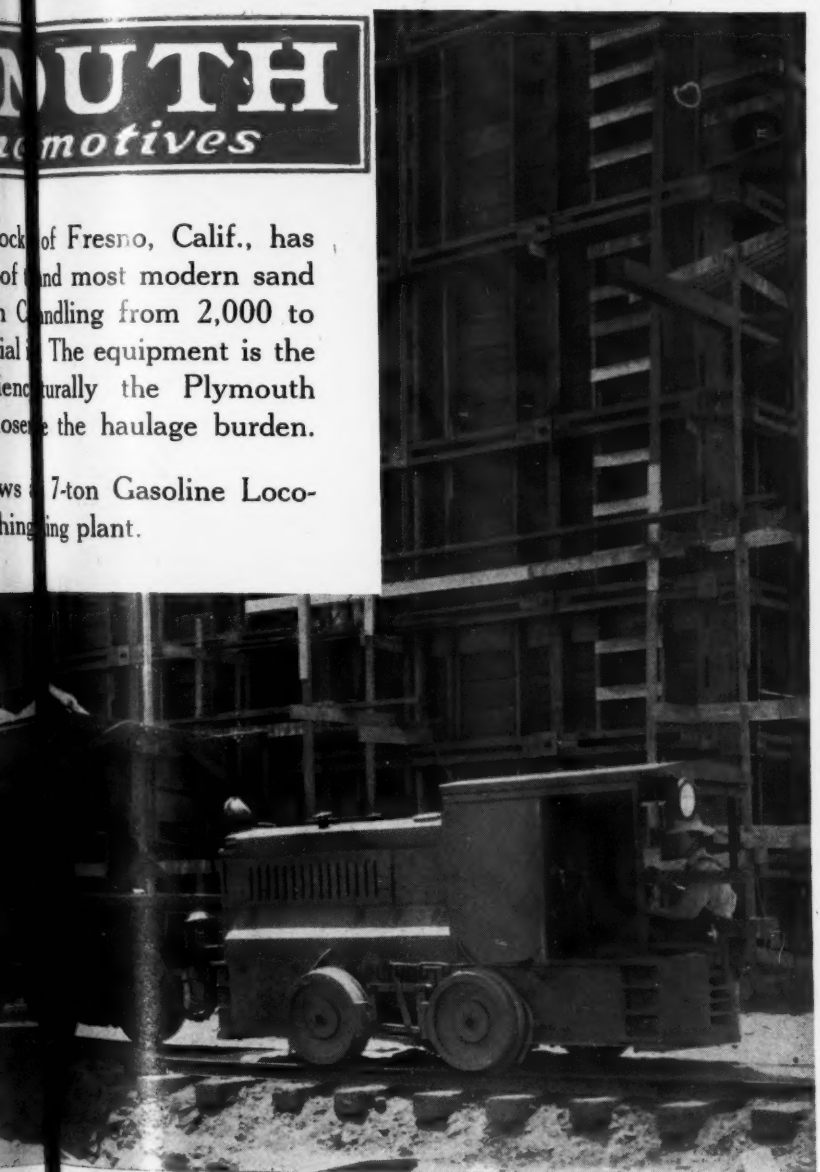

New, Plant of the Service Rock Co., Fresno, Calif.

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**Plym motive Works) 206 Riggs Ave., Plymouth, Ohio**

# If you want Speed—Here it is

*Brownhoist cranes are built in a wide range of types and sizes. Write for a catalog giving more detailed information.*

"To convince myself that a Brownhoist is one of the fastest cranes, I timed this crane in loading cars from the pile.

"The result showed that the crane handled approximately 165 tons of sand in about 36 minutes, averaging better than 4 trips per minute."

This is an extract from a letter received by us concerning a small Brownhoist electric creeper crane equipped with a 1-yd. Brownhoist Clamshell and operating at a sand and gravel pit. This performance is typical of Brownhoist cranes. Thousands of users swear by them, not only for their speed, but also for their economy and long life.

*Write for Booklet 10 on Brownhoist small cranes*

**The Brown Hoisting Machinery Co.**
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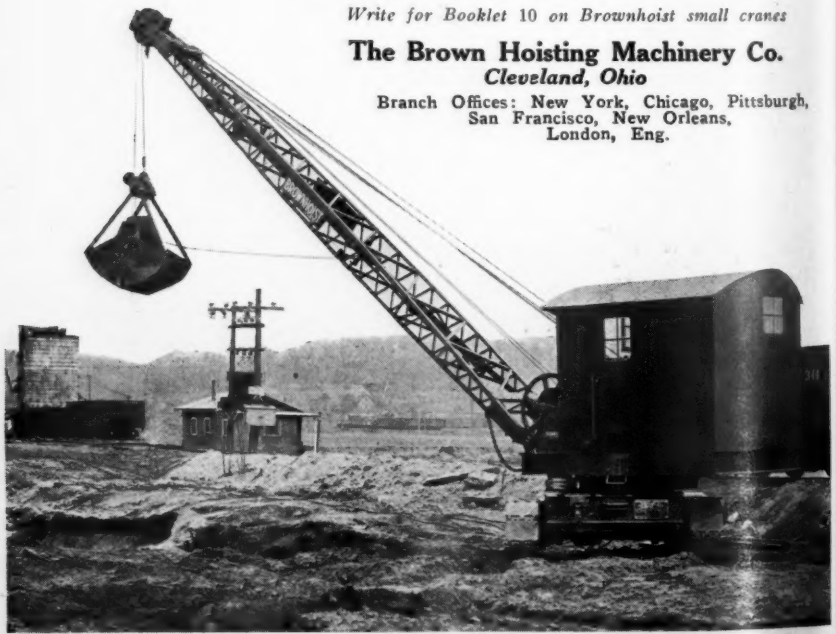


# BROWNHOIST

MATERIAL HANDLING MACHINERY

# South Dakota State Cement Plant State Owned and State Operated

## Wet Process Plant of 2,000 Barrels Daily Capacity Special Freight Rates Secured for 500 Mile Radius

THE legislature of South Dakota during 1917 passed a resolution to amend the state constitution to permit the operation of a state cement plant. This same resolution provided that the proposed amendment should be submitted to the electors of the state. At the general election on November 5, 1918 the electors voted in favor of the amendment. During 1919 the State Legislature passed a bill, that was approved by the governor on March 15, 1919, providing for the appointment of a Cement Commission to consist of five members with the governor as chairman. This bill defined the duties of this Cement Commission and provided for the issuance of bonds to the extent of $1,000,000 for the purpose of purchasing real estate and such equipment as might be needed to operate a cement plant. It also provided that $25,000 be appropriated for the purpose of exploration and investigation throughout the state.

This Cement Commission decided that the desired cement plant could not be constructed for $1,000,000. Another bill was therefore passed during 1921 providing for the issuance of bonds to the extent of $2,000,000. The Commission recommended the construction of a State Cement Plant in the vicinity of Rapid City. This Commission served under Governor Norbeck. A later Commission serving under Governor McMaster followed the recommendation of the first and proceeded with the constructon of the plant. Ground was broken on May 15, 1923, on the line of the Chicago and Northwestern Railway about two and a half miles west of Rapid City.

Favorable freight rates which will make it possible to ship cement from the state plant to any point in South Dakota, practically all of Wyoming, all of western Nebraska, two-thirds of eastern Nebraska, a part of Montana and northeastern Colorado have been arranged. The State Board of Railroad Commissioners determined the rates for all points within the state. These special rates enable this state plant to ship to the Colorado line before meeting competitive rates from Colorado plants. From Colorado and northwest the state plant has lower rates than any other producer up to the Montana state line.

Their rate conditions give the South

A Quarry View Showing the Shovel In Operation.

Dakota State Cement Plant a shipping radius with non-competitive freight rates of more than 500 miles.

The plant has a capacity of 2000 barrels a day manufactured by the wet process. The stone is obtained from a deposit of limestone near the mill. There is very little overburden to be removed. Shale is available along the railroad. Gypsum also is close at hand.

Drill holes for the blasting are sunk by Sanderson-Cyclone drills, while secondary drilling is handled by Ingersoll Rand tripod and jack hammer drills operated by compressed air supplied by a 12x10 inch single stage Ingersoll Rand air compressor. The stone is loaded, by means of a 50-B Bucyrus steam shovel mounted on tractors, into Continental side dump cars of 5 cubic yard capacity and hauled to the crusher by a twenty ton saddle tank Porter locomotive. Tracks of 36 inch gauge have been laid parallel to the quarry face. The Bucyrus shovel is equipped with a 1¾ yard bucket.

The stone is discharged into a 20 inch Superior McCully crusher. From this crusher the material is conveyed to a Jeffery swing hammer pulverizer. The material is then elevated to a 24 inch Stephens Adamson belt conveyor and delivered over a distance of 350 feet to the raw material storage building.

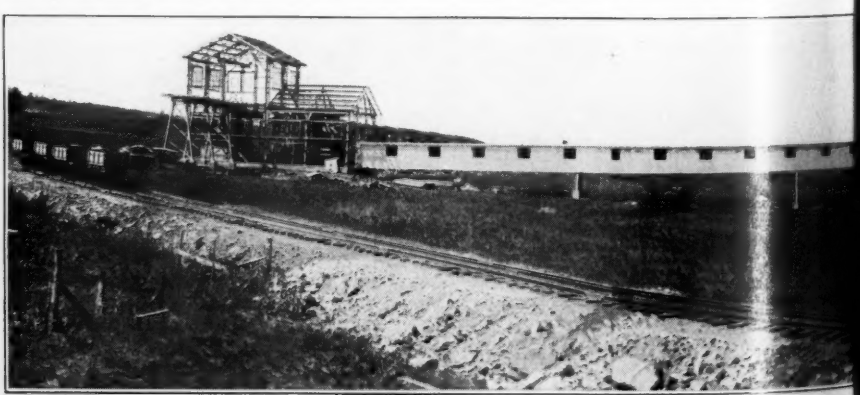
This building is a concrete and steel structure 408 feet long and 80 feet wide. An electrically operated Milwaukee crane of 6½ tons capacity runs the full length of this building. This crane is equipped with a 2½ yard clam shell bucket and is used for reclaiming the material in storage. This crane also unloads the shale from cars and places it in storage. A pan conveyor takes the shale from storage and elevates it to a two compartment loading bin. One of these compartments is for shale and the other limestone. The shale is passed through a Bartlett and Snow shale disintegrator before going to the loading bin.

After the limestone and shale have been mixed, the material is conveyed on a 24 inch inclined belt conveyor over a distance of 130 feet to steel storage bins over the compeb mills in the Raw Mill. These storage bins discharge into wet grinding Allis Chalmers compeb mills with swing feeders and are directly connected to 400 h. p. Allis Chalmers synchronous motors of 180 r. p.m. 3 phase, 60 cycle, 2300 volts. These mills discharge into a narrow slurry pit just above a slurry pump where the material is picked up and discharged into any one of six slurry tanks. They are of reinforced concrete construction.

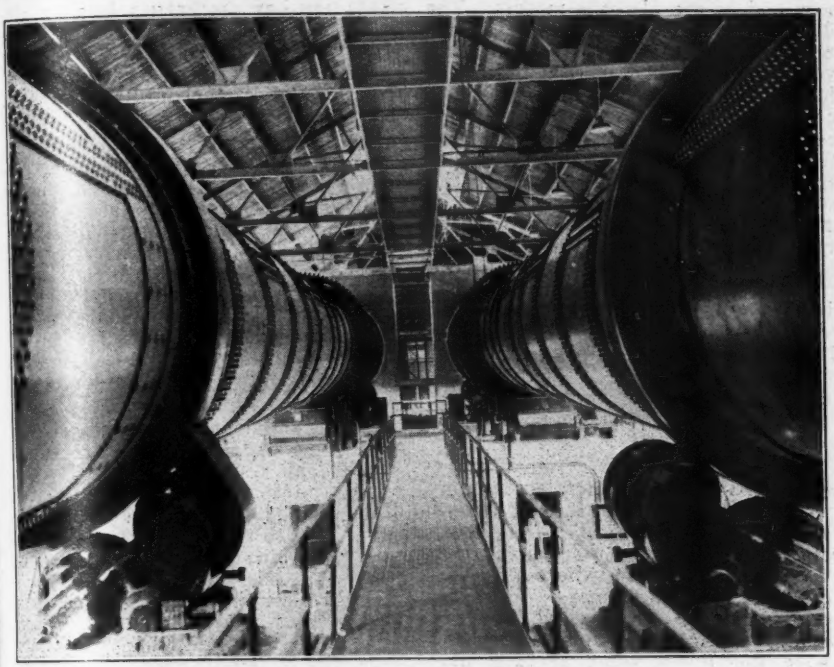
The slurry mix is delivered from the storage tank to two kiln feed tanks by a second slurry pump. These tanks are 20 feet high with an inside diameter of 20 feet. They also are of reinforced concrete construction and are located below the feed end of the kilns. Another slurry pump elevates the slurry to the Ferris wheel feeders. These feeders are arranged to drive from the kiln.

The slurry is introduced into the kilns from the feeders through water cooled feed pipes, one for each kiln. There are two Allis Chalmers rotary kilns, each 150 feet long with an inside diameter of 10 feet.

The clinker from the kilns drops



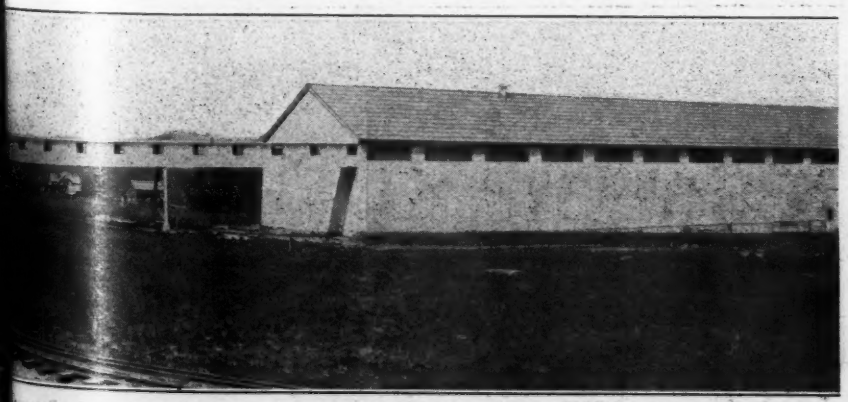
The Left Half of a Panoram



An Interior of the Mill Building Showing Kilns.

into two coolers each 60 feet in length with an inside diameter of 8 feet. From the coolers the clinker is received by a measuring machine that automatically records the amount of material passing. It is then delivered to a Webster pivoted bucket conveyor which travels directly under the measuring machine. This Webster bucket conveyor delivers the cooled clinker to the clinker storage or to the clinker bins as desired. This same bucket conveyor may reclaim the clinker placed in storage. This is accomplished by means of a tunnel which runs the entire length of the storage pile and through which the bucket conveyor operates for the full length. The material is drawn through openings in the roof of the tunnel and spouted into the Webster bucket conveyor. From the clinker bins the clinker is fed into the compeb by a swing feeder.

The compeb mills for grinding are of the same type as those at the



raw end as are also the motors. The discharge from the finish compeb mills is dropped to a Webster conveyor and carried vertically for a height of 55 feet to a 16 inch screw conveyor. This conveyor carries the cement over a distance of 140 feet to another elevator in the Stock House. This elevator raises it to the top of the storage bins where it is discharged into two 16 inch screw conveyors connected by a 16 inch cross conveyor. These conveyors distribute the cement into the different bins as desired. These bins are reinforced concrete of the silo type. They are 72 feet high with an inside diameter of 32 feet. There are six of these bins in two rows of three in a row. Their total capacity is 100,000 barrels of cement.

Cement is reclaimed from storage by two 12 inch Link Belt screw conveyors, running under the bottom of the bins, that deliver it to an elevator that raises it to the screen floor of the packing house, where it passes through Allis Chalmers revolving screens and is discharged into the packing bins. These bins are located above the Bates valve sacking machines by which the cement is automatically weighed and packed in bags.

The cement is loaded into cars by throwing the filled sacks onto a 30 inch Stephens Adamson belt conveyor that delivers the sacks to the door of the freight car.

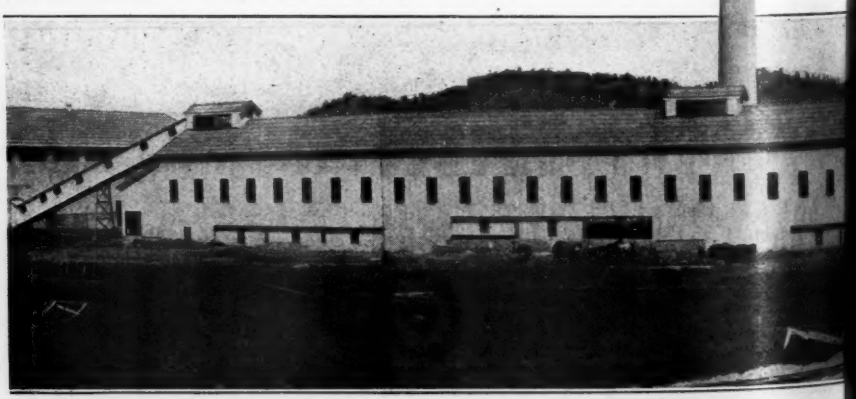
The coal pulverizing is handled in a concrete steel building 72x50 feet. The coal is delivered in cars that discharge into a track hopper. From the hopper the coal drops to a 30 inch apron conveyor that delivers it to a 26x24 inch Link Belt coal crusher. This crusher discharges into an elevator that delivers the coal to the raw coal bin. The coal is fed to an Allis Chalmers Ebro Type dryer, 50 feet long and 7 feet in diameter, from the raw coal bin.

From the dryer the coal falls into a pit where it is picked up by an elevator and delivered to the Raymond Mill bins. These bins are directly over the Raymond Mills, and discharge into the mills is by gravity. There are three of these mills of the roller type. The coal is reduced to a fine powder in these mills and by means of air cyclones is conveyed to a Link Belt screw conveyor that delivers the powdered coal to the powdered coal bins in front of the kilns.

The coal is introduced into the rotary kilns by an air blast from high speed fans.

The power plant consists of two Babcox and Wilcox waste heat boiler plant next to the feed end of the kilns and a turbine generating station on the east side of the boiler plant. These boilers are equipped with green economizers and superheaters. Steam is generated by utilizing waste heat from the kilns and passing it through the boilers. A 300 h. p. boiler is available for emergency use

Two 1000 k. w. 2300 volt, 3 phase, 60 cycle, 3600 r. p. m. turbo generators with automatic by-pass valves for low steam and overload conditions is included in the turbine station. The turbine station also includes two jet condensers of 18,000 pounds per hour steam



The Right Half of a Panora

The Locomotive Hauling Dump Cars.

capacity, one 25 k. w. turbo generator exciter set, one 27½ k. w. 1750 r. p. m. motor generator set, one 7 panel, 2300 volt switchboard, one 2 panel 480 volt switchboard, three 333 k. v. a. single phase transformers, two 12x10 inch single stage air compressors and two air receivers for 100 pounds air pressure.

This equipment was furnished by Allis Chalmers Manufacturing Co. In addition to this equipment there are two 12x7x12 inch boiler feed pumps, two 12x10x12 inch general service pumps, one Cochrane open type 1200 h. p. feed fater heater, one Permutit water softening system of 120,000 gallon capacity per 24 hours and two reaction and one salt tank.

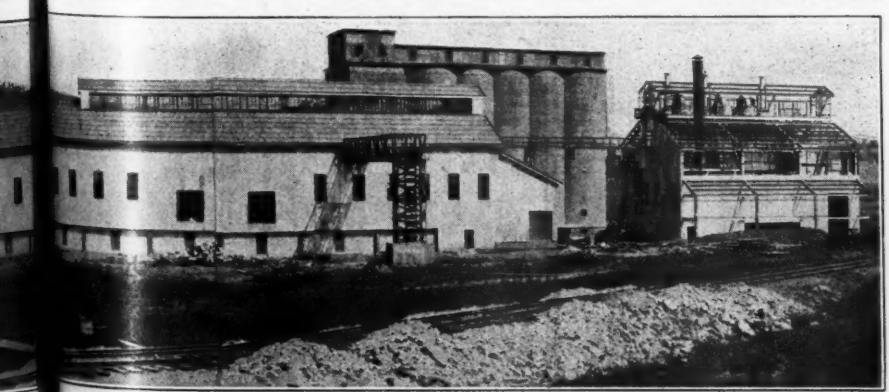
A reinforced concrete chimney 202½ feet high with a 10 feet inside diameter at the top completes the power plant. This chimney was designed by the Weber Chimney Company of Chicago.

The buildings are all modern in construction. All the foundations are of reinforced concrete while the superstructure is of structural steel with siding of corrugated iron and roofs of cement tile.

The dimensions of the various buildings are as follows:

| | |
|---|---|
| Crusher Bldg. | 56x30 ft. |
| Raw Storage Bldg. | 408x80 ft. |
| Main Mill Bldg. | 512x50 ft. |
| Coal Mill Bldg. | 72x50 ft. |
| Stock and Packing Bldg. | 120x67 ft. |
| Bag Bldg. | 99x54 ft. |
| Shop Warehouse Bldg. | 122x67 ft. |
| Office Bldg. | 80x62 ft. |
| Turbine Station | 48x42 ft. |

The Office Building, Shop Warehouse Building and Turbine Station are of concrete foundations and Shope brick walls. The Stock and Packing



Building and Bag Building are of reinforced concrete throughout.

The entire plant was designed by J. C. Buckbee Company. The principal building contracts were handled by the Kenwood Bridge Company of Chicago and the Carlson Snitkey Construction Company of Sioux Falls. The iron siding was supplied and erected by the Sweeney Hardware Company of Rapid City. The Federal Cement Tile Company of Chicago furnished and erected the tile roofing. The steel window sash was supplied by the David Lupton's Sons Company of Philadelphia. The motors for the entire plant were supplied by Allis Chalmers Manufacturing Company and they also supplied the kilns, grinders, compeb mills, and the greater portion of the power plant equipment. The conveying and elevating equipment was furnished by the Stephens Adamson Manufacturing Company, the Webster Manufacturing Company and the Link Belt Company.

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The attorney general of Missouri on July 15 filed an ouster suit in Jefferson City against the Atlas Portland Cement Company of Pennsylvania, charging the concern with acting in restraint of trade and free competition. The suit arises out of the company's membership in what is known as the Midwest Credit and Statistical Bureau of Chicago, an organization formed for the purpose of exchanging statistical information as to prices, production, etc. This company operates the largest cement mill in Missouri. Similar suits were brought against the Ash Grove Portland Cement Company and the Dewey Portland Cement Company of Kansas City, who pleaded guilty.

## American Chemical Society Meets In September

The annual meeting of the American Chemical Society will be held at Cornell University, Ithaca, N. Y., September 8 to 13, with scientists of the United States, Canada and Europe in attendance. America, it is pointed out, is still holding the leadership in chemical research which she wrested from Germany during the World War. Universities and industrial enterprises from all the states will send more than 1,000 delegates.

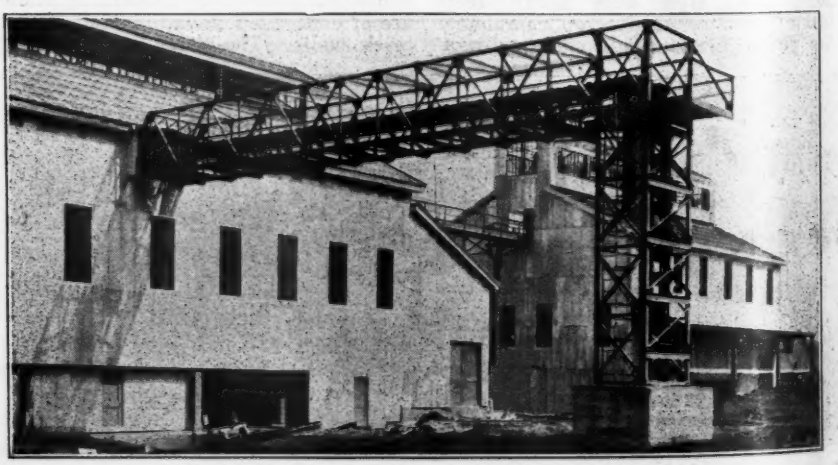
The Foreign chemists will speak at the meeting on Tuesday, September 9.

England is sending Sir Robert Robertson, president of the Faraday Society, and Sir Max Muspratt, a leading industrial chemist of Great Britain, and from the Continent, among others, will be Prof. S. P. L. Sorenson of Copenhagen, internationally known for his work on the hydrogen-ion of which he is the father. Sir Robert Robertson, authority on explosives, will describe the nature and use of T. N. T., in his address, "The Chemistry of the Trinitrotoluenes." Prof. Sorenson will discuss "Serum Globulins."

The nation's fuel supply will be one of the biggest subjects of the meeting. All nations, according to chemists, are engaged in a world-wide hunt for new fuel sources. Prof. S. W. Parr, University of Illinois, will lead round-table conferences on "The Storage of Coal and Spontaneous Combustion." Secretary Hoover's plans to relieve coal shortage and the report of the coal storage committee of the American Engineering Council, will be discussed.

The growing importance of chemistry to society will be the underlying theme of the second day, at which foreign chemical triumphs will be reported. Among the speakers will be Prof. or Sir Max Maspratt, vice-president of the Society of Chemical Industry.

Other subjects and divisions treated are water, sewage and sanitation, sugar and cellulose, a symposium of industrial and engineering chemistry on "Absorption," petroleum, paint and varnish, and on September 10 meetings of the physical and inorganic, industrial and chemical education divisions.



The Webster Conveyor At State Cement Plant.

# Cost Accounting in the Crushed Stone Industry

By D. J. HUTCHINSON

**THIS article is the first of a series to be written on costs in the crushed stone industry by Mr. Hutchinson expressly for PIT and QUARRY. Mr. Hutchinson is an accountant of wide experience and in the past three months, he has visited many crushed stone plants in preparation for these articles. If studied carefully, these articles will, we hope, give the producer a better knowledge of this phase of his business. Every producer should know whether he has made a profit over a given period and, if not, why. He should have a cost system that will enable him to detect faults, if any, in time to correct them before it is too late. Readers are invited to submit particular questions relating to cost methods to Mr. Hutchinson, care of PIT and QUARRY.**

**EDITOR.**

## Cost Accounting and the Determination of Selling Prices

THE cost of production is the basic element in the determination of selling prices. Competition, trade and market conditions and other factors enter in, but fundamentally prices are determined by the cost of production, especially with a basic commodity such as crushed stone.

This fact has long been recognized in economic thought, though in the mind of the business man it is sometimes apt to be pushed into the background and obscured by the multitude of other influences that seem to affect more directly the price he receives for his commodities. But it is worth while occasionally to get back for a moment to the fundamental, and there is nothing more fundamental in business than that price is determined in the first instance by the cost of production.

In fact the older economists' definition of price was "the cost of production to the marginal producer." This somewhat meaningless phrase has been recast by the later writers into more specific form, without in the least altering the substance of the statement, and we are now told that price is "that figure at which eighty-five per cent of a given commodity will be produced at a lower and fifteen per cent at a higher cost."

Whether this percentage is correct is a matter of fact to be determined with respect to each commodity. But the principle that price depends on cost remains, and its practical meaning to the producer in a competitive field is that he must know his costs or run the risk of being submerged in the lower fifteen per cent.

There are, of course occasions when good policy requires taking business at less than cost, but such a course is justified only when adopted deliberately as a matter of policy and not when followed through ignorance.

Moreover it is not always sufficient that the individual producer know his own costs, if his competitor is not equally well informed. Otherwise the one will take business from the other that he cannot afford and that results in loss to both.

For this reason much attention has been given in recent years to the development of uniform accounting methods in various industries. The portland cement industry for example has carried this work to an advanced degree. The retail milk dealers, the building managers and many other industries and lines of business have developed similar programs.

Many motives have contributed to this development. For one thing there has been a growing feeling that cooperation pays better than cut throat dog eat dog tactics; a recognition of the fact that what is good for an industry as a whole is good for the individual member whose prosperity often comes more easily along with than at the expense of the prosperity of his competitor.

Then too, by cooperative action, not only in accounting, but in engineering, sales and other fields as well, advanced methods have been placed at the disposal of many smaller institutions that could not have afforded to develop them alone. Many problems have been solved for mutual benefit at much less cost to the individual than he would have incurred in ac-

complishing the same results single handed.

But in the field of cost accounting in particular perhaps the greatest benefit of uniform methods that has lead more than anything else to their constantly increasing adoption has been the fact that they furnish the most intelligent basis of competition. We have shown that the selling price of any commodity, particularly a basic commodity such as crushed stone, where the elements of fashion, brand, novelty, monopoly and many others, do not enter in, is determined, broadly speaking for the industry, as a whole, by the cost of production. It is certain therefore that each producer must know his own costs to determine whether at the current selling prices he can conduct his individual business at a profit.

But more than that, it is necessary, for the general welfare of the industry as a whole, which means the welfare of the individual member, that the competitor know his costs also; that each producer speak the same language of cost. Unless the various producers measure their costs on a comparable basis, certain elements of cost are overlooked by one or another. This leads certain producers to bid for business, unknowingly, at less than cost, and business so obtained brings loss not only to the one who takes it but also to the competitor who, knowing what his costs are, lets it go by. The latter is deprived thereby of business to which he was properly entitled, or at least to which he was entitled to compete for on a fair basis. Both lose.

Uniform cost accounting methods, on the other hand, reduce the cost of production throughout the industry to a common denominator, enabling the various producers to speak a common language in their consideration of costs as applied to the determination of selling prices, and furnishing the only intelligent basis for competition.

Perhaps in some instances these principles may be carried too far, and by the widespread use of comparative cost reports, keyed of course to conceal the identity of the individual producers, material may be placed in the hands of individual producers that amounts in effect to a medium for price fixing. The appearance, as well as the fact of such action must be avoided, as it comes close to the restraint of trade practices that are generally condemned. But the possession of accurate cost data by the individual producer and the knowledge that his competitor is also figuring his costs on the same basis places each in the soundest position to compete for business.

**The Application of Uniform Methods**

The advantages of uniform accounting methods furnishing costs that are on a comparable basis cannot be denied. The application of uniform methods to any industry, however, presents practical difficulties arising from the variation in operating conditions that exists even in an industry having in general the uniform characteristics throughout that the crushed stone industry displays. Every operator attacks the problems of production in a somewhat different manner, resulting in different operating conditions that of necessity must be reflected in the cost accounting methods.

In arriving at the cost of production in any industry we are necessarily governed in our selection of accounting methods by the operating conditions with which we are confronted, and which it is the function of the cost accounting system to record. Obviously methods that are suitable for costing foundry operations cannot be applied to the manufacture of textiles, and the production of crushed stone, like every other industry demands methods applicable to its own peculiar problems.

Moreover the methods selected must conform not only to the operating conditions that characterize the industry as a whole, but they must be conformable to the individual conditions of the individual plant as well. Standard conditions can be referred to only as to an imaginery or ideal situation, which it is convenient to make use of for purposes of illustration and discussion. In fact, however, the operations of each plant differ from those of every other in some respects and to a greater or less degree.

It follows that a cost accounting procedure absolutely standard throughout an industry is impracticable, since the cost methods must first of all conform to the operating conditions of which they are born. The shoe must be fitted to the foot and attempts to apply cut and dried methods where they do not fit the conditions are certain to fail. The accounting system like any structure can not be super-

imposed. It must be built from the ground up.

But there are certain principles and methods of cost accounting that can be developed and applied to any industry, which, allowing for variation in detail to meet local conditions, will give comparable results, enabling all producers to calculate their costs on a comparable basis. Such uniform methods of procedure will be developed and presented in the following pages.

Obviously it is beyond our scope to provide for every operating contingency that may arise throughout the industry. In the classification of expenses for example, a chart of accounts sufficiently comprehensive to provide for every conceivable expense that every producer might incur would be impossibly cumbersome. So much detail would obscure rather than illumine the principles which it is our real purpose to illustrate.

Hence the detail that is presented herein has been elected because it is representative of average conditions and to illustrate the principles involved. It must always be considered as subject to modification wherever necessary to meet local conditions, and this modification can be made without altering in any way the fundamental procedure.

Referring again for illustration to the classification of expense account. Each operator will without doubt find certain items of expense that he never incurs, and other of his usual expenses will perhaps have been omitted. But the Chart of Expense Accounts is so designed that it is elastic enough to permit the inclusion or exclusion of any items without in the least affecting the method of expense distribution involved.

### The Elements of Cost—Material

Accountants are accustomed to considering the cost of production as comprised of three elements, material, labor, and expense, the latter being variously designated as burden, overhead, etc. Material and labor are customarily divided again into direct and indirect material and labor, the distinction being along the line of that material and labor which goes directly into the product as against that which is used in the course of production but does not become a part of the product itself.

In the production of crushed stone the "direct material" is the stone in the ground. Like most natural resources, it has in the strict economic sense no value whatever in its crude and natural state. It is only through the application of labor, material and expense in its production that it acquires value. The cost problem, therefore, from the standpoint of production is to get it out at the least possible cost. The writer knows at the present moment of a gold mine that operated profitably for many years but that has been closed for some time because owing to the increase in all the production cost, it now costs more to get the gold out than it is worth. Of course, the use of gold as the basis of our monetary system gives it a fixed and fictitious value, that does not exist in the case of any other commodity and introduces elements in the situation not existing in relation to other resources, but the example illustrates the point that the cost in the economic sense arises from the labor and expense of production.

From the standpoint of the producer, however, the stone or other natural resource does represent in most instances, some value, some cost in the ground. In this sense therefore, it is proper to consider this cost as representing the "direct material" cost of the product. This cost in the ground is represented by different factors depending on the form of ownership, and the basis on which the quarry is being worked.

Where the quarry site is owned by the operator in fee, it is the cost of the total amount of stone available which must be prorated over the stone produced, that represents the "direct material" cost. This item appears as "depletion." Depletion is a subject that will require more extensive treatment in its proper place. We are considering it here only as an element of cost. It should be noted, however, that it is not always, as stated above, the cost of the quarry site, but in some instances the fair market value, that determines the depletion rate. Moreover, it should be noted that depletion may be a cost factor under certain circumstances where the quarry site is not owned in fee but operated under a leasehold. These matters also will be covered more fully at a later point.

More often, however, quarries are not operated by the owners nor leased outright by the operators, but are operated on a royalty basis of so much per yard of stone removed. In this case the "direct material" cost is

represented by the royalty paid.

In addition to depletion and royalty charges, there are other items that in effect constitute a part of the cost of the stone in the ground.

One of these is the cost of developing or opening the quarry, apart from what is paid for the site or for use of the site itself. This is entirely apart also from the investment in plant structure, machinery, equipment, etc., the cost of which gets into production through the usual depreciation charges. In addition to this investment in permanent equipment, there is the cost of the labor and expense involved in opening the site before production starts. Even after production is under way it may happen that for a certain period of time costs will be excessively high due to the difficulty of using proper equipment, etc., in the limited area uncovered. These excess costs are not due entirely to current production, and are properly chargeable to the cost of the stone in the ground which must be equitably distributed over the later production of the quarry.

Another similar item is the recurrent stripping charge which is properly deferred and considered a part of the cost of the stone uncovered. Ordinarily, however, after the quarry is once opened the stripping will proceed at intervals and certain specific areas will be uncovered that should bear their own stripping charge. Stripping, therefore, differs from the cost of original opening in that it is distributed over the limited area of stone uncovered, instead of over the entire production of the quarry. How this is accomplished as a matter of accounting procedure will appear in our discussion of stripping as an expense item.

Summarizing the foregoing, the following items correspond to the "direct material" cost of crushed stone.

(1) Depletion (of site or leasehold value).
(2) Royalties.
(3) Development.
(4) Stripping.

As a matter of practical accounting procedure, however, the "direct material" nature of these items is passed over and they are treated as items of expense, which is the form in which they get into the cost of production.

One reason for this will appear from the fact that taken all together they represent but a small part of the cost of the stone produced. As stated above the real value of natural resources is not inherent in their crude and natural state but comes after they have been made available for use and their principal cost arises from the operations necessary to get them into usable form.

The "direct material" cost of crushed stone is therefore not of large importance in itself, except that just because it is comparatively negligible, one of the "conditions of the industry" that have been referred to as the determining factor in the application of cost accounting methods. The value of the commodity has a direct bearing on the cost accounting treatment, for the reason that a cheap commodity will not bear excessive handling for the purpose of determining the quantities involved. Handling increases the cost of the material and unless the material is worth more than the possible saving by careful handling, it is not worth the effort.

An error even of ten per cent for example, in the material cost of a commodity, the total cost of which only ten per cent is material cost, is only one per cent error in the total cost. Hence if the handling necessary to eliminate the ten per cent loss of material increases the total cost one per cent or more, it is not worth while. This is exactly what must be guarded against in determining the cost of so cheap a commodity as crushed stone, using the term "cheap" as applying to the relative value of the material itself.

Of course every operation increases this value so that waste or inaccurate measurement of material becomes progressively more important, until at the time of shipment it is necessary to know exactly what material is going out.

Ordinarily therefore, the product of the quarry is weighed only once and that is after the final loading in cars and trucks ready for shipment. In some instances the material is weighed into the crushers, but more often where such a record is kept it is based on the estimated capacity of the cars, multiplied by the number of cars crushed.

In one plant the writer found, however, that no record was kept of the quantities produced except the railroad weights, which were used as a basis for billing as well as for freight charges. Obviously that is going to the other extreme.

# The Milwaukee Municipal Crushed Stone Plant

## Plant Designed to Produce 300 Cubic Yards Daily Expect to Produce Stone Below Commercial Price

ECONOMISTS have estimated that one-twelfth of the people of the United States over twelve years of age are on the public payroll—city, county, state or national. Fewer than half of the people over twelve years of age are wage earners. Then there are a lot of semi-public and professional public servants. In spite of this fact, there are many public officials urging the voters to approve municipal operation of pit and quarry plants.

Government operation has succeeded in the case of many public utilities but when a state, county or city attempts the production of materials to be used in competition with materials produced by commercial producers such as cement, stone, etc., a good cost system on the government operation should be put in effect. There seems to be few figures available on the operation of crushed stone plants by cities and those that have been presented are questionable. Many costs in such city operations have been cleverly concealed and statements actually made that the municipal plant is able to produce the material as much as a dollar a cubic yard less than it could be bought.

There are cases, however, where the freight charges and other conditions are such that the city or state is forced to manufacture the product needed. This has been the situation that many cities have faced and the high freight charge on the commercial product has enabled such cities to produce their own material to advantage.

Boston, Massachusetts, at one time operated a crushed stone quarry. A firm of accountants retained by the city showed after a few months investigation that the city after five years of operation had wasted $1,000,000 on the quarry. The city disposed of the quarry and has been purchasing the commercial product ever since.

Baltimore wanted to try the same experiment but B. T. Fendall, then the city engineer, so strongly opposed the plan that it was dropped. Mr. Fendall at the time stated that he knew from experience that he could buy the stone cheaper than he could produce it from a municipal plant.

A General View of the Quarry.

The list of cities that have operated crushed stone plants is long. Some of these municipal plants appear to be doing well. Others should never have been started.

Several of our larger cities are now giving serious thought to the problem. The case of Milwaukee is interesting. The Department of Streets of Milwaukee has criticized the commercial product as being too dusty. Other officials felt that the stone could be produced by the city itself for less than it could be bought. A quarry has been built and has been in operation for about a year. During this time many changes have been made and now those responsible for the quarry are certain they will produce stone at less than the commercial price.

After a visit to the quarry it is hard to see how the stone was produced last year at a dollar a cubic yard less than the commercial price as has been claimed. A cost system has not yet been installed nor was one in operation when the statement was made.

The City Council of Milwaukee in 1912 approved the purchase of a site of about 20 acres for the purpose of producing material for road building. The purchase price was $58,000. An initial payment of $8,000 was made, and the balance of $50,000 was to be paid at the rate of $5,000 annually.

Before the first $5,000 payment came due, the city administration changed hands. The new administration refused to make payment, and a suit for collection was started. The outcome was such that the city relinquished the site.

In 1922 the county bought the site for $28,000. The City Council again took up the question of a city quarry and plans were approved whereby the city would lease the site now owned by the county and construct and operate a crushed stone plant.

In 1923 an initial appropriation of $5,000 was made to build the plant. This $5,000 and an appropriation of $20,000 last year appear to be all that has been appropriated for the construction and equipping of this plant. Undoubtedly, more has been spent. The plant at least represents a larger investment than $25,000.

The plan of operation is to place to the credit of the quarry at the beginning of each year a sum of $5,000 for operating purposes. This $5,000 is supposed to be wiped off the books at the close of the year by the quarry.

Drilling with Compressed Air Drills.

D. J. Hutchinson and P. M. Johanning.

The stone is sold to the city on the books. The employees are on the city payroll and all expenses of operation are paid by the city and charged to the quarry. As the city takes the stone, the quarry is credited on the books. Then at the end of the year the books are expected to balance or show a profit to the quarry.

The commissioner of public works, who is appointed by the Mayor, is in charge of the stone plant. The present commissioner, R. E. Stoetting, has placed a large portion of the responsibility in the hands of P. M. Johanning, an engineer. There are three foremen at the quarry. One of these spends all his time at the plant, and the other two have the additional responsibility of being ward foremen in the streets department. These ward foremen in this way have something to say about the production of the material that later they will use on the job. The balance of the force at the quarry consists of thirteen men divided as follows: three pit men, one shovel operator, three drillers, one hoist operator, three men for work in the crusher house breaking the material at the crusher, and two men for miscellaneous work such as loading screenings, etc. The truck drivers are not part of the quarry force. They are assigned as needed with trucks and trailers from a central city bureau. These trucks and trailers along with the drivers are under the control of this central bureau which assigns them to the different city work. The time of the drivers is charged to the quarry account but only the actual cost of operating the trucks and trailers is charged to the quarry account. The depreciation, insurance, etc., on the trucks and trailers, are not charged to the quarry. Neither is there any provision that forces the quarry to carry depreciation on the equipment, purchased with the appropriations totaling $25,000. The officials appear to be only burdened with the responsibility of operating the quarry at a cost below the purchase price of the stone consumed.

The quarry is located about 200 feet from one of the main highways near the west limits of Milwaukee. The overburden that must be removed will prove to be a problem if the

Trucks Loading Under the Storage Bins.

stone is to be produced at a cost below the commercial product. There is as much as 25 feet of overburden in many places.

The stone is loaded by a Koehring shovel with a ¾ yard bucket into steel pit cars. These cars were built by Obenberg and Sons of Milwaukee. Two of these cars are of 2¼ yards capacity and three are of 1¼ yards capacity. After they are loaded they are pushed by two pit men over a standard gauge track to the foot of the incline to the crusher house. This arrangement is only temporary as Mr. Johanning plans to utilize a Fordson tractor to haul these cars.

At the foot of the incline the cars are hooked to a cable and drawn up the incline by a hoist into the crusher house. This incline is about eighty feet in length. At the top of the incline the cars are dumped. The material slides from the rear of the pit cars into a No. 6 Allis-Chalmers crusher.

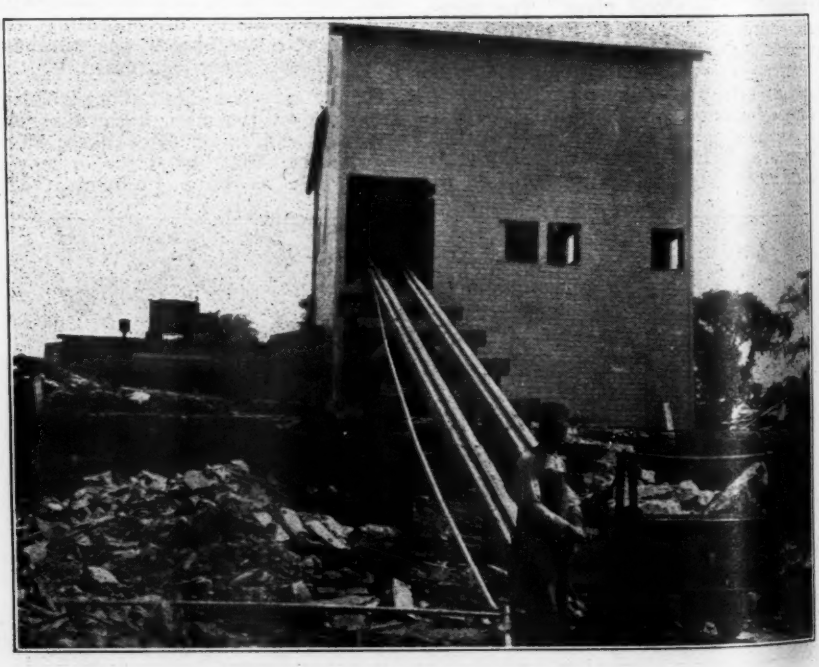
After crushing, the material is elevated by Allis Chalmers bucket elevators to an Allis Chalmers rotary screen. The oversize is sent back to a No. 4 Allis Chalmers crusher and after crushing, re-elevated to the screen.

The material produced is 2½, 1¼, ⅞ inch and screenings. The screenings are carried by a belt conveyor horizontally to the end of the crushing house and dumped into a pipe that drops the material to the ground.

The other material is delivered from the screen to the individual storage bins. Trucks are loaded directly under these storage bins. The screenings dumped on the ground are loaded by hand shovels into the trucks. During the visit to the quarry there were six Sterling trucks in use, each pulling four Highway trailers of 4½ yards capacity.

The drilling in the quarry is done with three Ingersoll Rand jackhammer air drills. Compressed air is supplied by a Westinghouse air compressor. The water is removed from the quarry by an American pump driven by a Le Roi engine.

The quarry payroll has been running recently between 75 and 80 dollars a day. This does not include the ward foremen, the engineer, Mr. Johanning, the Commissioner of Public Works, the clerks at the city hall, the Mayor or the many other city officials who have spent considerable time and money on the quarry.



A Quarry Car Ready To Be Hauled Up the Incline.

# Trap Rock Company of Wisconsin Has Modern Plant

## One of the Largest Trap Rock Plants in Northwest Producing 1,500 Tons of Extremely Hard Stone Daily

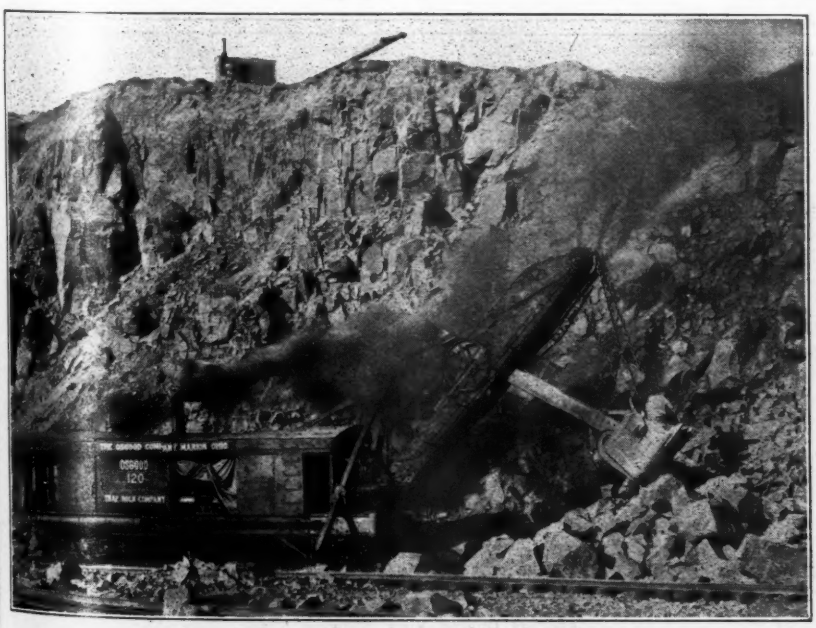
THE plant of the Trap Rock Company at Dresser Junction, Wis., one of the largest in the Northwest, is located on the tracks of the Soo Line Railway. This plant commenced operations in 1912. At the present time it has a capacity of 1,500 tons of extremely hard material daily, crushed and screened, ready for the market.

The first shovel operations at the Trap Rock Company were started with an Osgood 120, 6-yd. steam shovel, another machine of the same size and capacity being added in 1922. The plant at present, after various enlargements made from time to time, is equipped as follows:

One 60 by 84-inch Power and Mining Company's Jaw Crusher, one No. 9, two No. 6 and two No. 5 McCully Standards, two 10-inch McCully Superiors and two 6-inch McCully Reduction Crushers. The plant is electrically operated.

Two 18-ton Porter locomotives and Western Dump Cars, 4-yard capacity, are used in hauling the rock from the quarry to the crushing plant, a distance of about 2,000 feet.

The quarry has an average face of 80 feet. Because of the seamy nature of the rock, blasting in the usual manner, by drilling, cannot be done. Drifts, sometimes called Gopher Holes, are made into the bottom of the face after all loose material has been removed. These are loaded with heavy charge of power and set off at one time. This operation is repeated



A View of Quarry Showing the Shovel In Action.

along the entire length of the quarry, thus loosening enough rock for the entire season's production. All blasting work is done during the winter months.

Because of the extremely hard nature of the rock and because of the seams, many large blocks are left unbroken, making loading difficult for even the large Heavy Duty Osgood Shovels in use. Two of these shovels are used so that one may always be in action whenever the other is held up because of the necessity of reducing these large blocks before they can be loaded.

Early in 1922 an Osgood 1¼-yard Heavy Duty Revolving Steam Shovel on Continuous Tread, fitted with Dragline Equipment instead of Steam Shovel Outfit, was installed to strip the overburden of clay. This machine is doing excellent work on top of the spoil bank of a third cutting, after having disposed of two previous cuttings. This operation will be continued still further, and enough will be stripped in one season to maintain operations for a long time to come. Next year this machine will be equipped with the Standard Dipper and Boom Outfit and used in quarry work.

A well-equipped machine and blacksmith shop has been installed for making repairs.

John Wunder, Minneapolis, is president of the company; H. E. Wunder is production manager, with supervision of the crushing plant, and Harvey Wunder has supervision of quarry operations.

## Westinghouse Adjustable Insert

A new adjustable bolt insert has been designed by the Westinghouse Electric & Mfg. Co. for use in fastening machinery or other equipment to concrete floors, walls or ceilings. It does away with the disadvantage attending use of bolts embedded directly in the concrete, such as failure to register correctly with the mounting bolt holes of the apparatus to be installed. This new insert permits an adjustment of the bolt position after the concrete has set, and assures more satisfactory machine mounting. It consists of a cast-iron housing with a tapering body and containing a rotatable bolt carrier. The carrier is T-slotted to take the head of a standard machine bolt, and is of sufficient length to permit a ⅝-inch movement from the center. Once the adjustment is made there is no change of position possible.

Another Quarry View Showing Track.

# Prime Movers for Hydraulicing and Dredging Operations

By GEORGE B. MASSEY.

THE prime movers for centrifugal pumps are the steam engine, steam turbine, electric motor or internal combustion engine burning gasoline, kerosene or heavy oil.

For pumping water containing solids, it is necessary, or at least very desirable, to have the speed capable of considerable variation. The static head is apt to change, or the quality of material may require a higher velocity in the pipe line, or the length of pipe line may increase.

When installing any drive for this purpose, the maximum diameter of impellor which can be used in the pump shell and the maximum horse power and speed of the drive should be adequate for the maximum work to be performed. Then with easier conditions, the speed may be reduced or a smaller impellor used.

As the usual type of centrifugal pump takes the most horse power when pumping with the minimum discharge pipe, the prime mover should be capable of carrying this load in emergency.

The steam engine has long been a very satisfactory drive for large dredging pumps, the usual installation being a triple expansion vertical marine engine supplied with steam by Scotch marine or water tube boilers, preferably burning oil. Engine regulation can readily be suited to the conditions to be met as to speed and power. The speed of about 200 R.P.M. is adapted to direct connection with the pump provided a large runner and shell are used. The engine and pump are direct connected in almost every case.

The steam turbine is not adapted to driving a dredge pump because of its very high rotation which necessitates gearing down. It is also probable that sudden stoppage of the pump due to anything jamming in the runner would wreck the turbine.

There are four kinds of electric motors which could be used as prime movers for centrifugal dredging pumps, namely, the synchronous motor, the squirrel cage induction motor, the slip ring induction motor and the direct current motor.

The first two are seldom if ever used because of objectionable characteristics for this class of work.

The direct current motor is used very little as direct current is not apt to be available.

The slip ring polyphase induction motor, while not so ideal as the direct current motor variable speed drive, adapts itself very well to this service.

The standard synchronous or no load speeds are 600, 720, 900 and 1200 revolutions per minute, except in the case of the larger motors, the standard no load speed of motors over 200 horse power being 600 revolutions per minute.

On account of the slip, the motor revolves from 3 per cent to 5 per cent slower when driving its full load. This is the speed to use when arriving at the most suitable impellor diameter.

The slower speed motors have more poles, larger frames and are more expensive.

For direct driving the speed range of the motor must be exactly suitable for the impellor diameter and head conditions.

For driving the pump by means of a belt, the motor speed range is not so important, as the diameters of the pulleys can be changed.

With suitable banks of resistance, a slip ring motor can be operated continuously at lower speeds than the standard speed. The usual commercial range is from standard full load to thirty per cent less.

Motors for 2300 volts are used to some extent for driving pumps on dredges but it is more usual, in the case of 2300 volt current, to install transformers on the stern of the dredge and use 220 or 440 volt motors. Modern slip ring motors can be used on 220 or 440 volt circuits. This arrangement has the advantage of requiring a small cable from the shore to the dredge, of greater safety around the machinery and a minimum of large low voltage wiring.

Gasoline engines have the advantage of light weight and comparatively low first cost. However, the speed is high, which means more rapid deterioration and requires gear-

ing down by belting or chain drive to the pump. The fuel expense is high compared with kerosene fuel and very high as compared with the heavier oils.

The chief advantage in the use of the gasoline engine drive is on temporary installations requiring frequent knocking down for small yardages.

Heavy duty gasoline engines may be had which run at 800 to 1000 revolutions per minute and weigh 34 pounds per brake horse power at prices ranging from thirty-five dollars down to twenty-five dollars per brake horse power.

The gasoline consumption is ¾ pound per brake horse power per hour which amounts to two cents with gasoline at twenty cents per gallon.

The kerosene engine of the type used on small hydraulic dredges is horizontal and single cylnder. It can be rolled over and started by hand so that no air system is required. This very much simplifies and keeps down the cost of the equipment.

The weight runs about 235 pounds per brake horse power and the present prices about forty dollars per brake horse power. The consumption of kerosene is about one gallon per horse power of ten hours or one cent per horse power hour with kerosene in bulk at ten cents per gallon. The speed ranges from 200 R. P. M. slightly upward in the small sizes. Above seventy or eighty horse power it is well to consider seriously a heavy oil engine.

The heavy oil engine is being used more and more for driving pumps and other machinery on hydraulic dredges. The United States government is constructing four sea-going hydraulic dredges completely equipped for propelling and pumping by oil engines.

There is also a large government hydraulic dredge on the Ohio River so equipped.

There are two general types of oil engines, one the full Diesel engine which fires the charge by the heat of compression, and the semi-Diesel engine which requires a heated plug in the combustion chamber for starting and which fires the subsequent charges by the heat in this plug, the compression not being sufficient to raise the charge to an igniting temperature.

The Diesel engine burns the charge slowly and is not sensitive to change in speed so that it can be run at various speeds successfully. This makes it possible to obtain suitable pump speeds with the engine direct connected to the pump.

The semi-Diesel engine is very sensitive and it is recommended by builders that the catalog or designed speed be adhered to in order to obtain the best results.

The straight Diesel engine has an air compressor built into the engine for introducing the oil to the cylinders by air pressure.

Most of the Diesel type of engines now being constructed in moderate sizes are of the solid injection type, the oil being injected into the cylinder by a pump.

There are two types of these engines, one two-cycle and one four-cycle.

The two-cycle is lighter in weight and has no valves, levers or cams, the ports being opened and closed by the pistons.

The two-cycle engine is very sensitive to any increase in back pressure and the size of the exhaust pipe and its length must be according to the manufacturer's standards to obtain good results. This is not so true of the cross head type of two-cycle engine as the scavenging air enters the cylinder at a slightly higher pressure due to the proportioning of the compressing space below the piston.

Heavy oil engines weigh about 250 pounds, cost from fifty to seventy-five dollars and use about half a pound of oil, all per brake horse power.

With oil at five cents a gallon, the fuel cost would be about one-third cent per brake horse power.

The ideal speed for a belt drive is 5500 feet per minute, but this is not usually practicable in dredge work, the speeds running from 2000 to 3000 feet per minute.

Rubber belts give better service in damp locations than leather belts, and tightener pulleys, properly placed and used, will obviate a lot of belt attention and delays.

A belt should be used which has ample strength to do the work without having to be stretched so as to pull out belt lacings and burn out bearings. An inadequate belt is a poor money saver.

On large drives, the rope drive has some very desirable features. The installation is a little cheaper than the belting and the replace rope is only a fraction of the cost of a replace belt. Another advantage is that the slow-

ing down of the driven pulley will not throw the rope off as it will the belt. The direct connected pumping unit, whether it be steam or oil engine or electric motor, is far preferable to any other form of drive, as the friction is reduced, the side pull on bearings is eliminated and the efficiency is much greater.

It is necessary, on a hydraulic dredge with a cutter head to have five drums operate two spud lines, two bow swinging lines and the suction ladder hoist.

These drums are usually assembled as a unit with operating levers located conveniently for the operator. All drums have a friction clutch and a brake.

The controlling factor in the design of this winch is the speed and pull desired on the swinging lines, as this pull establishes to a large extent the ability of the dredge to dig hard material successfully.

The range of speeds and pulls on small hydraulic dredges with cutter heads is from 30 to 50 feet per minute and from 2000 to 10,000 pounds pull on a single line.

Usually swinging lines are single but sometimes a snatch block is used on the bank, thus obtaining twice the pull at half the speed.

On large oil engine dredges or on electric dredges the winch is driven usually by an electric motor. In the former case an oil engine drives a generator for all the auxiliaries.

On small dredges, the winch may be driven by belt by the one large oil engine or the one large electric motor, the one prime mover driving everything on the dredge.

There are three methods of getting the sand or other material into the suction pipe. The first is to rely entirely on the suction at and about the mouth of the suction pipe. This is successful in free flowing sand and lighter materials.

Material which will not respond to the suction only, can be loosened up and moved about by a jet of high pressure water so that it will respond more readily to the suction in the suction mouth. A small diameter of jet under high pressure is more effective than a larger jet and lower pressure.

A mechanical agitator, or cutter head, gives the best control over this most important operation of securing the maximum practicable quantity of solids in proportion to the water pumped.

To obtain this maximum percentage of solids, it is necessary to swing the dredge, lower the suction ladder, and revolve the cutter head and maintain the ideal conditions at the suction mouth for as great a percentage of the time as possible. This explains why one operator bringing to the task skill, experience or careful attention will show a yardage very much in excess of another.

Cutter heads should have as small a diameter as possible so as to exert the maximum force on the material being dislodged by the blades. For very abrasive material, renewable blades should be used and these blades should be of manganese steel.

The cutter head, on small dredges, may be driven from the main engine or motor by a belt. On larger machines it is driven by a motor or by a special engine.

It is necessary to have a small pump, usually centrifugal, to provide high pressure water for the gland of the dredging pump and for the water jet if it is employed.

It is necessary, also, to provide a means of priming the dredge pump. This may be done by exhausting the air by means of the high pressure water operating an ejector, by an ejector operated by air pressure or by a vacuum pump. In all of these cases, a flap valve in the discharge pipe is closed.

It is also possible to prime by filling the pump with water but this involves a foot valve which is never used in dredging.

## Midwest Crushed Stone Company

THE Midwest Crushed Stone Quarries of Greencastle, Indiana, have changed the name to Midwest Crushed Stone Company.

Their new rebuilt plant at Greencastle started full operations July 28, 1924. The old plant was destroyed early this Spring by fire.

The new plant is modern in every detail. The plant is now fireproof. The framework is of steel and the walls and roofing are of corrugated pine zinc manufactured by the American Zinc Products Company of Greencastle.

The officers of the Midwest Crushed Stone Company are: C. C. Cartwright, President; L. R. Cartwright, Vice-President; E. R. Cartwright, Treasurer; C. F. Meyer, Jr., Secretary; and E. B. Taylor, Manager.

# Portland Cement Output in July, 1924

The statistics shown in the following tables issued by the Department of the Interior, and prepared under the direction of Ernest F. Burchard, of the Geological Survey, are based mainly on reports of producers of portland cement but in part on estimates. The estimates for July, 1924, were made necessary by the lack of returns from two plants. Production and shipments for the month are the highest on record, and stocks though decreasing rapidly since March, 1924, are greater than at the corresponding season of any earlier year.

*Production, shipments, and stocks of finished Portland cement, by districts in July, 1923, and 1924.*

| Commercial District | Production, July | | Shipments, July | |
|---|---|---|---|---|
| | 1923 | 1924 | 1923 | 1924 |
| Eastern Pa., N. J. and Md. | 3,216,000 | 3,418,000 | 3,484,000 | 4,206,000 |
| New York | 654,000 | 718,000 | 730,000 | 962,000 |
| Ohio, Western Pa., and W. Va. | 1,284,000 | 1,503,000 | 1,442,000 | 1,955,000 |
| Michigan | 783,000 | 1,058,000 | 895,000 | 1,100,000 |
| Wis., b. Ill., Ind. and Ky. | 1,817,000 | 2,166,000 | 1,848,000 | 2,570,000 |
| Va., Tenn., Ala. and Ga. | 626,000 | 962,000 | 583,000 | 1,109,000 |
| Eastern Mo., Ia., and Minn. | 1,259,000 | 1,333,000 | 1,544,000 | 1,633,000 |
| Western Mo., Neb., Kans. and Okla. | 956,000 | 935,000 | 1,062,000 | 993,000 |
| Texas | 397,000 | 409,000 | 411,000 | 442,000 |
| Colo. and Utah | 256,000 | 273,000 | 276,000 | 293,000 |
| California | 1,083,000 | 986,000 | 1,069,000 | 1,025,000 |
| Ore., Wash. and Mont. | 289,000 | 268,000 | 368,000 | 327,000 |
| | 12,620,000 | 14,029,000 | 13,712,000 | 16,614,000 |

*Production, shipments, and stocks of finished Portland cement, by months, in 1923 and 1924, in barrels.*

| Month | Production | | Shipments | |
|---|---|---|---|---|
| | 1923 | 1924 | 1923 | 1924 |
| January | a7,990,000 | 8,788,000 | a5,628,000 | 5,210,000 |
| February | a8,210,000 | 8,588,000 | a6,090,000 | 5,933,000 |
| March | 9,880,000 | 10,370,000 | 10,326,000 | 8,995,000 |
| First quarter | 26,080,000 | 27,746,000 | 22,044,000 | 20,138,000 |
| April | 11,359,000 | 11,726,000 | 12,954,000 | 12,771,000 |
| May | 12,910,000 | 13,777,000 | 14,257,000 | 14,551,000 |
| June | 12,382,000 | 13,538,000 | 13,307,000 | 15,036,000 |
| Second quarter | 36,651,000 | 39,041,000 | 40,518,000 | 42,358,000 |
| July | 12,620,000 | 14,029,000 | 13,712,000 | 16,614,000 |
| August | 12,967,000 | ..... | 14,971,000 | ..... |
| September | 13,109,000 | ..... | 13,698,000 | ..... |
| Third quarter | 38,696,000 | ..... | 42,381,000 | ..... |
| October | 13,350,000 | ..... | 14,285,000 | ..... |
| November | 12,603,000 | ..... | 10,251,000 | ..... |
| December | 9,997,000 | ..... | 6,408,000 | ..... |
| Fourth quarter | 35,950,000 | ..... | 30,944,000 | ..... |
| Preliminary total | 137,377,000 | ..... | 135,887,000 | ..... |
| Amount of under estimate | 83,238 | ..... | 25,118 | ..... |
| Final total | 137,460,238 | ..... | 135,912,118 | ..... |

The Virginia Portland Cement Corporation, subsidiary of the International Cement Corporation, New York, is beginning construction of its proposed new plant at Baltimore, Md., to cost $1,500,000. It will be completed next spring.

Persuant to the power conservation program in effect throughout Southern California the American Crushed Rock Company operating in the wash east of Pomona, Calif., has changed all its power equipment from electricity to gas. Capacity of the plant is about 21,000 tons of crushed rock per day.

# Petersen Sand and Gravel Company Operating Unique Plant

## Ground Storage Tunnel Reclaiming System Adopted Producing 25 Cars Daily at Janesville, Wisconsin

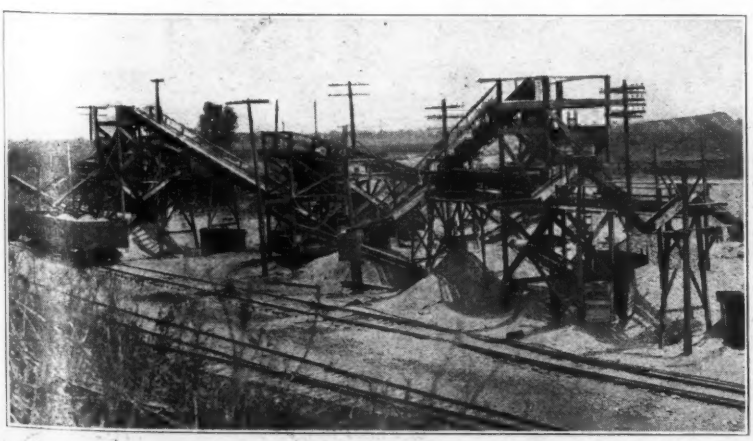
THE Petersen Sand and Gravel Company has completed and put into operation a unique sand and gravel plant without bins at Janesville, Wisconsin. Construction on this plant was started in September, 1923, and the plant actually started production in the early Spring of this year.

Ground storage with a tunnel conveying system was adopted in preference to a permanent concrete bin storage system. Concrete storage bins would have been a considerable expense and would not have been as adaptable to this plant as the layout installed. The present arrangement was installed at a cost much lower than an adequate set of wood or concrete storage bins would have required. The entire plant can be taken down and moved in a day. The present plant has a loading capacity of 25 cars a day, and plans now being developed contemplate increasing this to 100 cars a day.

The overburden averages 5 feet running from 3½ to 6 feet. This overburden is loaded by a Marion steam shovel in Koppel cars and dumped at one end of the deposit. The plant is located on quite a grade so the cars are sent down the grade by gravity and dumped. The cars are drawn back up this grade by horses. This grade is so steep that horses are used. The material in the pit is loaded by a Barber Greene Loader equipped with a Buda Gas Engine. There are two of these loaders at the plant. One is in operation while the other is held in reserve. These loaders work within a radius of 17 feet. The deposit is 105 feet to the water level and there is approximately 1300 feet of gravel below water level. The proportion of gravel to sand varies from 60-40 to 50-50. Operations are being carried on at the present in a 45 foot face.

These loaders deliver the material to a Barber Greene Portable Conveyor that operates within a radius of 50 feet. The portable conveyor and the loader can be moved as occasion demands. This portable conveyor is 50 feet in length and brings the material to a central belt conveyor which is in 15 feet sections and 175 feet long at present. Sections can be added as the work in the pit extends.

Additional sections of 15 feet each can be added as the pit is further opened up. By swinging the portable conveyor and the portable loader, it



This View Shows the Possibility of Loading Three Cars.

The Barber-Greene Loader at Work.

is possible to work the deposit 67 feet on each side of the central main conveyor. Another 30 foot Barber Greene portable conveyor is available for use if needed.

The material is carried on this central conveyor by a 24 inch belt to a grizzly where the oversize is sent to a No. 2 Austin jaw crusher and the material passing the grizzly is sent to the screens. After the material rejected by the grizzly is crushed, it is then thrown back onto the central belt conveyor by a short belt conveyor and delivered to the screens.

The material on this central conveyor is brought to two pairs of Universal vibrating screens. Vibrating screens were adopted because of the small head room and their large capacity. These screens are 3x8 feet. That material passing each screen is sent on another 24 inch belt conveyor to another screen. There are two of these conveyors, one on each side of the central conveyor, each leading to a Universal vibrating screen. The gravel from one screen goes to one and the sand from the other screen goes to the other belt conveyor. These conveyors are also in 15 feet sections. Each of these conveyors delivers to a Universal vibrating screen for the final screening.

Shuttle conveyors have been installed at this point so that the material can be loaded directly into the cars or to the ground storage as desired.

The sand and gravel are loaded to the cars either from ground storage by Barber Greene tunnel conveyors or to the cars direct from the shuttle conveyor. A railroad siding runs in front of the plant. The material is shipped over the Chicago, Milwaukee and St. Paul and the Chicago and Northwestern Railways.

A force of twenty men is employed at present to handle a production of 25 cars a day. All material shipped is weighed by a Fairbanks Morse track scale.

The entire plant is driven by elec-

The Two Side Conveyors from Main Conveyor.

tricity with the exception of the Barber Greene loaders which are driven by gas engines and the Marion shovel which is driven by steam. The electric current is supplied by The Janesville Electric Company.

The outstanding feature of this plant is the extremely low cost for the capacity. Among the other features are the following:

(1) There are loading facilities for loading three cars at one time. The loading system constitutes a very flexible scheme that permits easy moving with little delay in time.

(2) A large storage capacity at a very nominal cost—much less than the cost of storage bins. Loading can be done very rapidly.

(3) The plant is very low. The plant is less than 35 feet in height at the highest point.

(4) Early production was possible because of the use of sectional conveyors. This production was possible as the construction was developed. This permitted early profits. The average sand and gravel plant cannot expect to realize a profit for two years or more.

The Petersen Sand and Gravel Company is incorporated under the laws of Illinois. O. A. Petersen is president, G. R. Bascom is vice-president and treasurer and H. R. Hanson is secretary. Mr. Bascom also is district manager for Barber Greene.

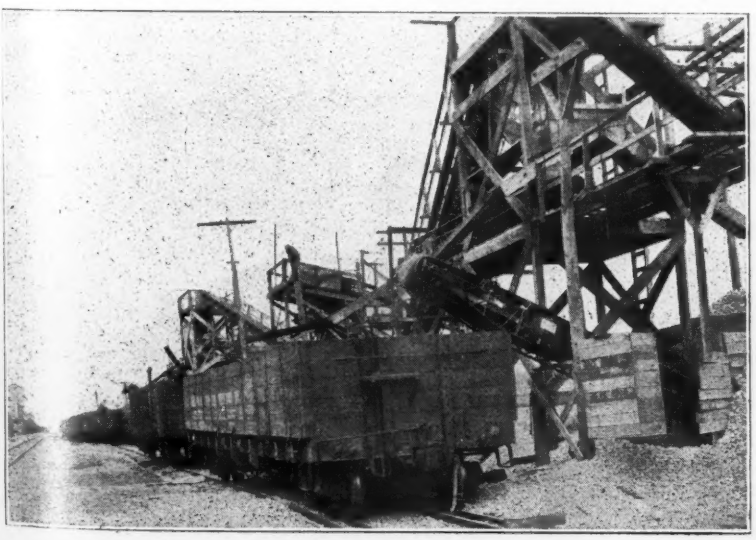
## 13th Annual Safety Congress

The 13th Annual Safety Congress of the National Safety Council will meet in Louisville September 29 to October 3. Speakers of national and international prominence will be present, and more than 4,000 industrial plants and Community Safety Councils in 60 American cities will be represented. The increased membership of the Council speaks for the increased interest in safety activities.

Secretary of Commerce Herbert Hoover, and Secretary of Labor James J. Davis will speak. Others of the 275 speakers will be Richard F. Grant, president Chamber of Commerce of the United States; Dr. Arnold J. Jacoby, director, psychiatric clinic, Detroit; C. F. Kettering, vice-president and chief engineer, General Motors Research Corp., Dayton; James Herron, nationally known student of human problems in industry, Chicago; Judge Shepard Bryan, Atlanta, Ga.; Dr. Augustus Dyer, Vanderbilt University, Nashville, Tenn.; Mrs. John Sherman, president, General Federation of Women's Clubs, Estes Park, Colo.; Bishop Woodcock, Episcopal Diocese of Kentucky, Louisville; and Dr. C. E. A. Winslow, Yale University.

Some industrial features will be an extensive report of a study made by nationally known experts on causes of benzol poisoning; a thorough report of research work into corrosion and its relation to safety in chemical plants; prevention of lead poisoning and health education of our foreign families.

Industries are coming more and more to realize that most accidents are due primarily to mental conditions of the individual; therefore, psychiatrists, psychologists, physicians and surgeons are being included in the program. The council will exhibit its new industrial safety film, which is being produced at a cost of $10,000, also from six to ten other safety films. Members of the American Automobile Association, the National Automobile Chamber of Commerce and the International Chiefs of Police Association will be on the program.



Loading Cars from Storage.

# Workmen's Compensation

THE question of workmen's compensation concerns everyone who is connected with industry. It is being considered from all angles so that future regulations and adjustments may be made with the best results. It is a comparatively new subject having developed within the first quarter of the twentieth century. The next decade will undoubtedly bring changes leading to a fair degree of standardization. All phases of the subject lead to the conclusion that it is practicable and in harmony with sound economic principles.

Workmen's compensation may be defined as the indemnification of the employee for loss sustained because of bodily injury or death resulting from his employment. The theory is based on the belief that accidents during work frequently arise from prevailing and often unavoidable risks inherent in the nature of modern production. The economic consequences of these injuries should be borne by the industry in which they are sustained and by society for whose service they occur, as well as by the workman who suffers from the injury. The employer thus assumes responsibility for loss in human beings just as he does for loss in equipment. Hence the obligation should be estimated in with the cost of operation and not charged to the producer.

It is acknowledged that under the old method there was little possibility of satisfactory adjustment for loss on the part of the employee. If a workman sued his employer, he was faced with almost insurmountable obstacles. His suit was barred if the injury was due in any way to his own negligence or to the negligence of another employee. In other words the worker was forced to assume all ordinary risks. He was also obliged to assume the burden of proof in establishing a charge of negligence on the part of the employer. This became increasingly difficult, in fact impossible, as industry became complicated and the employer more remote and inaccessible. In case of a workman's death there was no redress because action had to be a personal one. Hence, a workman received little consideration when indemnification came through his own efforts. He was frequently worse off because of his efforts inasmuch as bad feeling would result from his attempt to force his employer to meet his claim. Litigation in connection with claims is sure to cause waste, delay, and bitterness, all harmful to industry and hence bad economy.

Before the present compensation method came into existence, there was some effort made to modify the old system. Some of the employer's defences were taken from him in an attempt to improve the situation for the employee. Expenses for settlement in court, however, were burdensome both to the workman and to the employer and the entire proceeding was unsatisfactory. This was the situation at the opening of this century.

The first American Compensation statute was passed in 1902 in Maryland and was promptly declared unconstitutional on the ground that it deprived the parties concerned of the right of trial by jury. The administration of the law had been left in the hands of the State Insurance Commissioner. This law applied to mining, quarrying, railways, and municipal construction work. While the effort was unsuccessful, the idea of a better method of dealing with the problem had not been destroyed. In 1908 the Federal Government provided for compensation for accidents in certain dangerous occupations.

In 1910 New York passed a Compensation Law making indemnification for hazardous occupations compulsory, and for others, optional. The law did not go into effect until 1914 because of the necessity of amending the State Constitution. Within six years 42 states and 3 territories had compensation laws. Certain non-hazardous occupations such as agriculture, domestic service, and public service are not included. In several states disability arising from occupational disease is included.

Invariably associated with compensation for injury is the problem of accident prevention. It is estimated that the loss of earning power due to accidents in the United States in 1917 was $1,117,790,000. This covered 28,000 deaths and 3,877,000 injuries. Such statistics show the economic necessity of preventing accidents. Some of our inventive genius is now directed toward the problem of safety devices. Protection of workers from occupational disease has increased. Such efforts create a feeling of good will which is a valuable asset.

## Sand, Gravel, Stone Now Second Largest Shipper

**Second Only to Coal. Freight Rate News. National Portland Cement Association Has Adopted Trade Marks.**

IN SPITE of the fact that car loadings generally have fallen off during the first half of 1924, the report of the American Railway Association for the week ended August 2, the last report made, shows that there were 61,767 open top cars loaded with sand, gravel and stone during that week. This is the greatest number of loadings ever reported in one week in this industry, according to T. R. Barrows, secretary of the National Association, and it is one of the few, if not the only one, that is showing a steady increase in car loadings.

Up to the week ending July 19, when 60,571 cars were loaded, a record loading in itself, the industry had never before even approximated as many as 60,000 cars a week. Secretary Barrows says the figures for the week ending August 2 establishes a new high record.

At the offices of the railway association it is stated in the six months ending with June the carriers achieved a net operating income of $390,983,857, compared to $446,847,186 in the corresponding period of the preceding year. In that same six months' period the total car loading this year was 27,658,938, compared to 28,979,703 in the first half of 1923. The record in car loading in the first half of the year, however, was well ahead of that in the corresponding months of 1922 which were 24,115,037. Next to coal, the sand, gravel and stone industry is the largest single user of railroad equipment. The present loading is far exceeding that of grain and grain products, iron and steel, ore, and live stock, which are listed by the American Railway Association as major items of transportation.

Secretary Barrows has notified members that carriers in Central Freight Association territory and Western Trunk Line Committee territory are proposing to cancel the application of the combination on shipments of sand and gravel between the two territories. The National Association protested this cancellation of the rule without action being taken to protect members' interests against an increase in their present rates. It is estimated that a cancellation of the combination rule will add about 30 cents a ton to present rates.

Several members of the National Portland Cement Association have adopted trade-marks which they use in marketing sand produced by their companies. The Washington office is engaged in handling applications of certain members for the right to use trade-marks. Applications for registration of trade-marks are filed with the Patent Office in Washington. Although the trade-mark regulations of the Government provide that the trade-mark must be placed upon the merchandise to which it applies, they are subjected to exceptions which apply in the case of articles which, manifestly, cannot be imprinted with the trade-mark. This is true in the case of certain grades of coal which are marketed under a trade name registered at the Patent Office. Coal producers who have registered trademarks on their coal have printed small placards which are stuck in the top of the cars after they have been loaded at the mines.

## Road Show and Convention Meets January 5-9

Every indication is that the 1925 Road Show and Convention of the American Road Builders' Association, to be held at the Congress Hotel, Chicago, January 5 to 9, will in every way eclipse all past records. The program committee is in charge of Prof. T. R. Agg, whose widely varied experience in the highway field guarantees a well-balanced program of general interest.

Application blanks for space in the Road Show are being mailed by Mr. Upham, business director of the Association, to all concerns whose names are available, and the annual banquet, hotel arrangements, registration and other features are being planned. Nearly 17,000 square feet of additional floor space suitable for heavy exhibits will be provided, and there will thus be room for more and better exhibits than in the past. Additional application blanks may be obtained by addressing him at 37 West 39th Street, New York.

## Government Survey of Concrete Pavements

A fact-finding survey of the economic value of reinforcement in concrete pavements, national in scope, is to be conducted for the U. S. Bureau of Public Roads by C. A. Hogentogler of that Board. This survey, says Chas. M. Upham, Director of the Advisory Board on Highway Research of the National Research Council, will be conducted in co-operation with agencies interested in this important subject. Mr. Hogentogler, who has had fifteen years' experience in highway construction and research and is the author of important research papers published in "Public Roads," is a member of the American Concrete Institute and Associate Member of the American Society of Civil Engineers.

## Preparing For a Big Turn

### How the Wholesale and Retail Markets Stand, the Labor Situation and What is Looked for in September

By Our Eastern Correspondent

A SEASONAL lull is noted at New York and vicinity, in the sand, gravel and crushed stone markets, but there is increased interest in advance work. Renewed optimism is in evidence, and it is believed that the turn of September will indicate a decided revival in purchases. Incoming inquiries indicate that there are numerous orders to be placed for appreciable account. Road building, also, is holding up well in the eastern states, and there is fair call for broken stone and other materials for such operations.

Building contracts at New York are now running in the neighborhood of from $7,000,000 to $9,000,000, weekly. Plans now out for estimates have advanced from a basis of about $9,000,000 and $10,000,000 weekly in July to more than $20,000,000, per week, estimated costs. The labor situation is decidedly "easy," skilled and common labor being available in desired number. The wage scales remain uniform, and sand pits and stone quarries throughout this district, including New York, New Jersey and Pennsylvania, are well manned.

Best washed gravel continues in the New York wholesale market at $1.75 a cubic yard, both 1½ and ¾-inch stocks, cargo lots, alongside dock. Building supply dealers are quoting the material at $2.75 a cubic yard, delivered. Orders from the latter branch of trade are growing more encouraging, with quite pronounced tendency to stock up for fall account.

Good washed sand is priced at $1.00 a cubic yard, wholesale, carload lots, at New York, and stands firm at this figure. Building supply interests are holding $2.00 a cubic yard for stock, delivered. The general volume of call shows increasing strength.

Crushed stone maintains quite firm at $1.75 a cubic yard for 1½-inch stock, and at $1.85 for ¾-inch, wholesale, cargo lots, alongside dock. In the retail market, the supply dealers have reduced the quotation to $3.00 from $3.25, both sizes, delivered.

The Portland cement situation at New York is quite uniform, with a bottom quotation of $2.15 per barrel, carload shipments, alongside dock. Delivered to the building supply dealer's yard, or on the job, the figure is $2.50. The retail quotation is firm at $3.00 a barrel, with standard 10-cent bag rebate.

Portland cement shows a slight advance in the wholesale market at Boston, now being quoted at $2.64 a barrel in cargo shipments, alongside dock, without bags. The retail holds at $3.45 for delivered material, truck-load basis, $3.60 for less than truck-load orders. White Portland cement is priced at $2.00 a bag, retail, in this district. Mortar sand in truck-load quantities is selling at $1.75 a ton, delivered, while in the wholesale market, the level is $1.00 a ton. For beach sand, dealers are asking $5.00 a ton, delivered. Crushed stone is quoted at $1.45 a ton, wholesale, both 1½ and ¾-inch sizes, while retail, a figure of $2.50 is current, delivery on the job. Good washed gravel continues at $1.40 a ton wholesale, 1½ and ¾-inch stocks.

Contractors and building supply dealers at Philadelphia, Pa., are paying $2.10 a cubic yard for the best washed gravel, 1½ and ¾-inch sizes, carload shipments. Exactly the same level is current for crushed stone, same sizes. Wholesale quotations on hydrated finishing lime maintain at $23.00 a ton, while common hydrate material is priced at $16.00 in the local wholesale market. Common lump lime is being turned wholesale at $1.24 a barrel, 180 pounds, net, while finishing lime is selling at $22.00 a ton to dealers and contractors. Portland cement is at $2.40 a barrel, wholesale quantities, subject to usual cash discount.

The Charles Warner Co., Wilmington, Del., prominent in the sand, gravel and lime industries, has acquired the properties and business of the Penn Sand & Gravel Co., Tullytown, Pa., with capacity of 2,000 tons a day.

The Van Sciver Corporation, Morrisville, Pa., has acquired the local sand and gravel properties of the Curtis & Hill Co., with an output of about 5,000 tons per day, and will take it over at once.

## Model 37 Turbo Waughammer

*Turbo Waughammer*, a new bulletin just issued by The Denver Rock Drill Mfg. Co., of Denver, Colo., describes Model 37 Turbo Waughammer, its design and construction, also Model 337 Waugh Turbo Drifter, and Drifting Drills, Stopers, Steel Sharpeners and Steel Puncher.

## Pittsburg Holds Up Her End

### The General Tone of the Industry is Quite Lively, with Prices Uniform and Steady Hereabouts

By Our Pittsburgh Correspondent

SAND AND gravel production in the Pittsburgh, Pa., district continues unabated, nor is there any marked curtailment in demand to affect the current rate of output. All the leading producers' diggers and other river craft are active, and heavy tonnage of material is finding its way to the local port, as well as to neighboring sections, under good distribution.

The general tone of the industry is optimistic. Attention has been given recently to stocking-up in anticipation of the forthcoming call, and some producers have developed fair reserves for this purpose.

Seasonal repair work for the sand and gravel fleets is showing its usual decline at this time, and the majority of vessels that regularly ply the rivers are in good shape for heavy traffic. The local Federal Engineers are making a number of improvements on the rivers, with the installation of equipment at the various locks.

The price situation holds quite uniform and only fractional changes in quotations have ensued during the past month. The general tendency is towards low figures. The call from contractors, building supply dealers, iron and steel mills, and others continues fair, with growing strength in volume.

Best river sand is being turned at $1.00 a ton at the diggers, with rate for haulage advancing at 10 cents per ton per pool. At the storage yards, the figure continues at $1.25 a ton, f.o.b. hoists, advancing to a rate of $1.40 per ton under different delivery conditions.

For the best quality clean washed river gravel, averaging 1½-inch stock, prevailing quotations vary from $1.05 to $1.10 per ton, wholesale, at company docks. At the diggers, 65 and 70 cents per ton is asked, with advancing rate for haulage of 10 cents per pool.

Crushed stone is selling at $2.85 a cubic yard, carload shipments, wholesale, in the Pittsburgh market, the same rate holding both for 1½ and ¾-inch sizes, identical with a year ago. Portland cement is being sold on wholesale account at $2.19 and $2.20 per barrel, without bags, subject to usual discount.

The Iron City Sand Co. is maintaining a good average rate of production and distribution, and has a large number of vessels of its fleet in daily service. The Rodgers Sand Co., the Keystone Sand & Supply Co., the Ohio River Sand Co., and J. K. Davison & Brothers are among the active producers on the rivers at the present time, with large aggregate tonnage output.

## How the Cement Mills Are Faring

### July Was a Record-Breaking Month in Distribution and August Promises to Be Another Good Month

By Our Special Correspondent

GREAT ACTIVITY continues at the cement mills in the Lehigh Valley district of Pennsylvania, and every indication is that the present high production schedules will be maintained indefinitely. The past fortnight or so has shown a revival in inquiries for advance shipments from building supply interests and general contractors, giving strong indication of a busy season to come.

The month of July was nearly a record-breaker in the line of distribution from these parts, close to 4,000 carloads of cement leaving the mills in this period; this is about 1,000 carloads in excess of July, last year. The month of August bids fair to duplicate this record.

The labor situation is good, with plenty of available men. The majority of the plants are giving employment to close to regular working forces, and the activity at the mills, in contrast to other prominent industries in this section, such as iron and steel, textile, etc., has served to attract considerable good labor.

The Atlas Portland Cement Co., is holding to a high rate of output at its large mills at Northampton and expects to continue so indefinitely. The Lawrence Portland Cement Co., also with mills at Northampton, has been another heavy shipper of material in recent weeks; the July record of the plant very nearly reached top figures. The Lehigh Portland Cement Co., here and the plants at Fogelsville, Omrod and West Coplay continue well on the active list.

Other mills in the Lehigh Valley district that are especially active at the present time are the Coplay Ce-

ment Mfg. Co., Coplay; Nazareth Cement Co., Nazareth; Bath Portland Cement Co., Bath; Giant Portland Cement Co., Egypt; and the Dexter Portland Cement Co., Nazareth, and the Alpha Portland Cement Co.

The Lehigh Valley mill base, Universal, Pa., Buffington, Ind., Leeds, Ala., and Iola, Kans., show no change from a $1.95 per barrel quotation, carload lots, without bags, likely to prevail indefinitely.

The Signal Mountain Portland Cement Co., Chattanooga, Tenn., is said to have preliminary plans under advisement for the erection of a new unit at its mill, to include several buildings, to cost about $500,000 with machinery. Officials of the company have organized a subsidiary interest, to be known as the Signal Mountain Sand & Gravel Co., to operate with a capital of $250,000, local sand and gravel properties.

The Hermitage Portland Cement Co., Third Avenue, Nashville, Tenn., has plans under way for extensions in its plants to cost approximately $275.000.

Officials of the International Cement Corporation, 342 Madison Avenue, New York, have organized the Kansas Portland Cement Co., Kansas City, Mo., as a subsidiary, to operate an existing mill in Kansas, recently taken over by the parent organization. The new company will be capitalized at $500,000. H. Struckmann is president, and Baxter D. McClain, secretary.

## New Rate Schedule In Indiana

### The New Intrastate Rates. Not all Gravel Diggers Dig for Pearls. Lehigh to Study Quarrying

By Our Indianapolis Correspondent

IN THREE cases which had been presented to it regarding rates for intrastate shipments on Indiana railroads for crushed limestone for farm purposes and for sale, gravel and crushed stone, the public service commission has established a schedule of maximum rates which may be charged on these shipments.

The schedule was promulgated in the cases of the Mid-West Crushed Stone Company, concerning shipments from Spencer and Greencastle to points on the C. & E. I. railroad; of the Terre Haute Sand and Gravel Company for rates from Summit Grove to points on the same railroad and of the Kickapoo Sand and Gravel Company on rates from Peru to points on the same road, the Wabash and Nickel Plate roads.

The schedule gave two lists of prices, one for single line shipments and one for shipments which travel over more than one line. The rates by ton, net weight, range from sixty cents in the first list and 70 cents in the second, for twenty miles or less, to $1.50 and $1.55 for 275 to 300 miles.

The quarrying district of Bloomington will be the scene of special study by a party of teachers and students of Lehigh University, Bethlehem, Pa., this month. Members of faculties of the large universities are with the party.

The finding of a large pure colored pearl in the gravel being used for concrete paving, by the city engineer of Booneville, Ind., caused a stampede from the city of Booneville reminiscent of the Alaska gold rush.

The Grant County Gravel and Sand Company, Marion, Ind., has been incorporated with a capital of 250 shares of no par value to excavate for gravel, stone and sand. The directors of the company are Linfield Myers, Thomas E. Johnson, Harry M. Bartlow and Samuel Warner.

Covington, Ind., is to have a large, modernly equipped sand and gravel pit, according to H. L. McGurk, president of the Interstate Sand and Gravel Co. The company's old plant will be torn down and replaced.

The Walker Brothers Stone Company has been incorporated at Bloomington, Ind., with a capital stock of $5,000 to operate a stone quarry. The incorporators are James Walker, Owen Walker, and William B. Headley.

Articles of incorporation of the J. S. Bower Stone company at Wabash, Ind., have been filed. J. S. Bower of Decatur, Ind., will be in charge of the plant, south of the city, formerly operated by W. T. Horn and Orley Grey, in association with D. A. Pike and Charles Latchem. The equipment of the stone quarry has been leased from Mrs. Orley Grey for a period of four months at the rate of nine cents per cubic yard of stone, and the owners of the quarry, L. L. Hyman and Charles Latchem, will receive six cents per cubic yard for the stone.

*Bulletin No.* 1460, "Allis-Chalmers Compensated Type Shaking Screens," just issued by Allis-Chalmers Mfg. Co., Milwaukee, describes this machinery with diagrams.

## *Health and Production*

Increased production is the aim of all business enterprise today. The best intellects in every organization are at work on this problem. "Maximum Production" is the slogan of the twentieth century. To secure maximum production executives are looking for the most up-to-date equipment; they are rebuilding or remodeling their plants; they are studying methods of handling labor most advantageously. They are reducing labor turnover and useless loss of time and money. They are handling the problem of production with the most intelligence, based on scientific principles. A significant phase of this tendency toward efficiency and scientific management is the emphasis which is being placed on the question of health. It is most hopeful for the future of our civilization that experts agree that health is a paying proposition.

There are about thirty-five million industrial workers in the United States. Statistics show that an average of about eight days wages are lost per year by each of these workers because of sickness. With $3.00 a day taken as an average wage this means more than seven hundred million dollars. If the workers lose millions the loss in terms of production must be estimated in terms of billions, billions of dollars lost because of sickness on the part of workers! And the actual loss of time does not cover all loss due to health conditions. There is no possibility of estimating loss due to poor work because of bad state of health. It cannot be estimated with any degree of accuracy, but that this loss is great is unquestionable. Employees are less efficient and are more subject to accidents when they are in a low state of health. Accidents are expensive. Unhealthy workers are expensive. Hence there is an increasing tendency on the part of executives to reduce the amount of poor health and low vitality among employees.

Medical service is provided in many manufacturing plants for the welfare of employees. Rest-rooms, recreational advantages, opportunities for physical training, and other means of securing and maintaining fitness for work are found in industrial establishments. Control of occupational diseases and their prevention are the subject of continual study on the part of specialists. Protection of employees from harmful gases, fumes, poisons, etc., is recognized as essential. These efforts to improve the health of workers result in greater efficiency, reduced labor turnover and increased production. They are practical investments not charitable enterprises. Ill health in the family results in loss of time and wages and reduced purchasing power. In one family this, of course, has no effect on general conditions; but when it is multiplied by thousands the result may be important. Hence, what appears like altruism is in reality sound business sense and foresight. What may operate to improve the conditions of future generations of workers functions now to increase dividends for stock holders and salaries for employees. It is gratifying to all concerned that soundness of health may be estimated in terms of financial growth.

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## Cement and Concrete Study

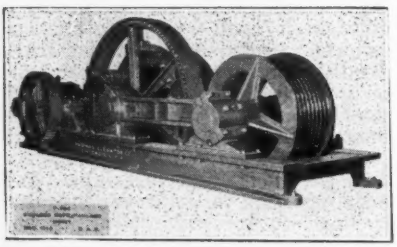
A broad and scientific investigation of the properties of cement and concrete will be undertaken by the Bureau of Standards of the Department of Commerce in conjunction with the Portland Cement Association of Chicago. The program has now received the full endorsement of the Advisory Committee to the Department of Commerce and will be put into effect as soon as the technical forces can be assembled.

Besides utilizing its own discoveries, the committee purposes to secure from all laboratories, research institutions, organizations and individuals, all possible information regarding concrete. The research will include an intensive study of the chemical and physico-chemical properties of Portland cements, of the raw materials used, and the products into which they are converted when used in concrete.

The investigation will involve a study of the pure ingredients, the influence of rock impurities and the natural deviations from the maximum composition, the temperature and time effects in manufacture, the reactions occurring in setting, the physical and colloidal behavior and hydration phenomena in setting, and the physico-chemical influence of many extraneous agents possibly affecting the material in service.

## New Thomas Hoist

*Bulletin No.* 40 of the Thomas Elevator Company, Hoyne Ave. and Monroe St., Chicago, describes Thomas Endless Rope Haulage. This Thomas Hoist—see accompanying illustration—is intended for use only where the distance of travel is beyond the practical range of utility of the single fixed drum type; that is, more than 350 to 400 feet. It is in



The Thomas Hoist.

more common use where the distance of travel ranges from 500 to 3,000 feet.

As regularly furnished, hoists of this type are fitted with drums having machine-grooved slip rings, cut steel gearing, through-bolt bearing, forged shafts and solenoid brake to automatically retard momentum of hoist and load when current is shut off.

It will be of interest to our readers to know that a Thomas Endless Rope Haulage Hoist is in use in the plant of the Ohio River Sand Company at Louisville, Ky.

## New Waukesha Motor

Simplicity of design is the characteristic of the new Waukesha Model "Z" Motor, now under production by the Waukesha Motor Co. of Waukesha, Wis. It is designed to meet the requirements of the taxi cab and light speed truck manufacturer. The cylinders are of Ell head type, cast enbloc, and are of 3¼ inch bore and 4½ inch stroke, 149 cubic inch displacement.

Much of the exceptional performance claimed for this motor is ascribed directly to the type of cylinder head design used—the Ricardo type—which, they say, produces great results in power and economy. The power peaks at 2300 R. P. M. and at this speed develops 33 brake horsepower.

Lubrication is of force feed type from geared oil pump, driven from camshaft. Oil is forced through the hollow camshaft to each of the three camshaft bearings and from these bearings through drilled holes in crankcase to each of the three main bearings. Particular attention is given to balance of all the parts. Provision is made for all standard S. A. E. mounting of clutch, starter, magnetic carburetor and generator. The engine is of the three point suspension type.

## Silent Hoist Car Puller

The Silent Hoist Electric Capstan Car Puller is described by the manufacturers as powerful, compact, waterproof, dirt-proof, and fool-proof, of low first cost, low upkeep cost, and requires but one man to operate it. It is driven by an electric motor, all mounted on a self-contained fabricated steel I-beam base, and has the Silent Hoist self-locking non-reversible, worm gear drive and removable phosphorous bronze bearings throughout. The Silent Hoist Model T-5 Puller has a draw bar pull of 5,000 pounds at 25 feet per minute.

## Jeffrey Tanktred Type Loader

Since the manufacture of the first Jeffrey Portable Bucket Type Loader in 1910, for handling coal, Jeffrey loaders have come to be used widely in handling crushed stone, sand, gravel, ashes, earth, coke, salt, fertilizer and other loose materials.

In 1920 the Jeffrey Radial Loader was brought out to meet various developments in industries. This type is made in two sizes, with capacities of from one to two cubic yards per minute.

As the demand for bucket type portable loading equipment developed, a machine of extraordinary strength and ability to move over soft, rough or uneven ground became necessary. With this in mind, the Jeffrey Tanktred Loader was built. The elevator boom follows lines similar to the Radial Loader boom, but the 3-wheel chassis is replaced by a Tanktred crawler mounting, the lower end being fitted with a clean-up device and scoop. The Tanktred has a capacity of 1½ to 2 cubic yards per minute, and handles crushed stone, etc., through 3½ inch ring.

The framework is built up of wood and steel to provide strength and elasticity. Strands of No. 102-B Jeffrey Hercules chain carry the two buckets, which are 18 inches long, of malleable iron. The tread proper is of heavy steel plates bolted to a chain of cast steel side bars, hardened steel knuckles and hardened steel pins. The clean-up device consists of revolving spiders with hardened steel pin inserts and a steel plate scoop. The two spiders are driven independently by two chain drives from a countershaft on the boom. All the driving mechanism is mounted in a rigid steel and cast iron self-contained frame which in turn is mounted on the framework proper of the machine. All gears are steel with cut teeth, all bearings bronzed and grease oiled, and all parts interchangeable.

## Novo D H G Drag Line Hoist

The Novo Dragline (D H G) Hoist—a "Real Gravel Producer"—was built especially for gravel pit work. Only one man is required to operate the hoist.

There are two sizes—one large enough to handle a ⅛ or ½ yard scraper and another size big enough to handle a ¾ or 1 yard scraper. On a hundred foot haul the smaller outfit will deliver to the screener from 250 to 350 cubic yards of gravel in a 10-hour day, depending on size of scraper used. The larger outfit will deliver to the screener on a hundred foot haul from 550 to 750 cubic yards of gravel according to size of scraper in a 10-hour day. The August issue of *Novo Power* is also out, featuring Novo engines in various fields. Copies marked on request by Novo Engine Co., Lansing, Mich.

## Du Pont Service Bulletin

The August issue of Du Pont's Explosives Service Bulletin contains an article on Secondary Blasting by J. B. Stoneking, M. E., Technical Representative. This gives in brief form a few pointers for efficiency and economy in this work. This bulletin is available on application to E. I. Du Pont de Nemours & Company, Inc., Wilmington, Del.

## Slate Producers Outing

The Slate Industry announces an outing at Prospect House, Lake Bomoseen, Vt., over the week-end, Saturday, September 6, 1924. There will be bathing, fishing, games, "good feed," and plenty of smokes. This will afford an opportunity for producers and distributors of slate products to get together and discuss common problems.

## New Incorporations

The Western Pennsylvania Sand and Gravel Co., of Pittsburgh, was recently incorporated for $5,000, by George H. Flinn, A. Rex Flinn and M. J. Feeney.

Field and Wild Quarry, Inc., was incorporated July 18, 1924, to operate granite quarries, with capital stock of $50,000, by August P. Hedberg, Hannah G. Hedberg, Ernest A. Cullman and Gerde O. Cullman, all of Quincy, Mass.

The Standard Portland Cement Co., with principal offices at Moundsville,, W. Va., was recently incorporated for $150,000, by D. B. Evans, S. B. Wilson, J. B. Dorsey, and I. B. Wilson.

The Kansas Portland Cement Co., Kansas City, Mo., has been incorporated for $500,000 to operate a cement mill. H. Struckman is president and Baxter D. McClain secretary. The company will be affiliated with the International Cement Corp. of New York, of which Mr. Struckman is also president.

The Orofino Reorganization Co. of Orofino, Idaho, was incorporated for $30,000, to operate cement and fertilizer plants.

The Alder Creek Cement Products Corp., of Forest Port, Oneida County, New York, was incorporated for $50,000 by J. Band, A. M. Gantner, and J. G. Hoffman.

Peerless Sand-Cement Brick Co., York, Pa., was incorporated for $200,000 by James W. Neuman.

The Findlay-Thomas Co., Manhattan, N. Y., has been incorporated for $5,000 to manufacture cement plaster, by R. L. Findlay and E. M. Thomas.

The Springfield Washed Gravel & Material Co. has been incorporated for $40,000 by George L. Ohma.

Joseph S. Fulton, Manhattan, New York, incorporated for $20,000 to manufacture cement and lime. Incorporators, J. S. and V. W. Fulton.

Wilson Lime Co., Inc., Buchanan, Va., was incorporated with capital stock of $25,000 to $50,000, by Charles L. Allen, Kam, W. Va., president; Annie W. McCullough, Buchanan, secretary, and Edwin W. Allen, Schenectady, N. Y., to manufacture and deal in building materials of all kinds.

The Petroleum Sand Products Corp., New York City, has been incorporated for $2,500,000 to $5,000,000.

The Signal Mountain Sand & Gravel Co., Chattanooga, Tenn., has been incorporated for $25,000 by John J. Sevier, C. S. Stewart, F. A. Stephenson, J. P. Hoskins, W. A. Ladd and J. J. Caldwell.

Prepared Lime and Mortar Co., Newark, N. J., building materials, $25,000 preferred, 100 shares common, no par.

Milwaukee Lannon Stone Co., Milwaukee, Wis., incorporated for $25,000 by Hugo Kraenzlen, Louis J. Kraenzlen, and H. Schattschneider.

Legrand Stone Co., Des Moines, Iowa, incorporated for $10,000 to $110,000.

Harnett Sand & Gravel Co., Washington, D. C., incorporated for $25,000, to start operation of plant August 1.

Puget Sound Lime & Oil Co., Inc., of Seattle, incorporated for $400,000. Name changed to "Puget Sound Lime & Chemical Co."

Muscle Shoals Portland Cement Co., Sheffield, Ala., incorporated for $100,000 to manufacture Portland cement, by Thurmond Harris, Samuel W. Kendall and J. C. Harris, all of Sheffield, Ala.

The California Rock and Sand Co. of Los Angeles, has been incorporated for $100,000, of which $500.00 is paid up. Directors are A. G. Lorbeer, Okey Meadows, Rush Meadows, et al. Atty., Cooper, Collings and Shreve.

## Recent Patents

The following patents of interest to readers of this journal recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, Continental Trust Building, Washington, D. C., at the rate of 20c each. State number of patent and name of inventor when ordering.

1,501,566. Lining for cement-drying kilns, John L. Lundberg, Alpena, Mich., assignor to Huron Industries, Inc., same place.

1,501,630. Rotary rock-drill. Fred S. Stoll, Los Angeles, Calif.

1,501,999. Loading and unloading apparatus. Norman T. Harrington, Cleveland, Ohio.

1,502,462. Apparatus for cleaning gravel and the like. Harry F. Curtis, Philadelphia, Pa.

1,503,157. Crusher for mineral ores. Alexander Halliday, Prince Rupert, British Columbia.

1,503,703. Grinding-mill for rocks, ores, and like material. Edward H. Moyle, Los Angeles, Calif.

1,503,813. Excavator, Paul Burke, Green Bay, Wis., assignor to North-west Engineering Co., same place.

1,503,866. Toothed cutter-lip. Howard G. Washburn, Lafayette G. Johnson, and Joseph R. Thill, Flat River, Mo., assignors to American Manganese Steel Co., Chicago, Ill.

1,503,954. Coal-screening apparatus. George S. Jaxon, Huntington, W. Va., assignor to Link Belt Co., Chicago, Ill.

1,504,235. Loading-machine, Robert P. Greenleaf, Cleveland, Ohio, assignor to Frank Billings, same place.

1,504,412. Crushing Machine. Carl T. Anderson, Elmhurst, Ill., assignor to Webster Mfg. Co., Chicago, Ill.

1,504,701. Process and apparatus for making cement. Spencer B. Newberry, Cleveland, Ohio.

1,504,702. Process for burning cement clinkers. Spencer B. Newberry, Cleveland, Ohio.

1,504,781. Machine for pulverizing material. Ralph E. H. Pomeroy, Canton, Ohio.

1,505,060. Apparatus for excavating tunnels. LeRoy A. Quayle, Cleveland, Ohio.

## Chicago Pneumatic Changes

The Chicago Pneumatic Tool Company announces the transfer of Mr. Ross Watson, formerly District Manager of the Cleveland Branch Office of this company to the District Managership of the Minneapolis Branch to succeed Mr. D. M. Wesbrook, now General Manager of the Canadian Pneumatic Company. Other recent changes include the transfer of Mr. L. J. Westenhaver, from the Pittsburgh Office to Cleveland as District Manager of that branch and Mr. E. C. Stroup, Compressor Engineer in the Boston territory, has been moved to the Pittsburgh District.

## Brownhoist Catalog M-24

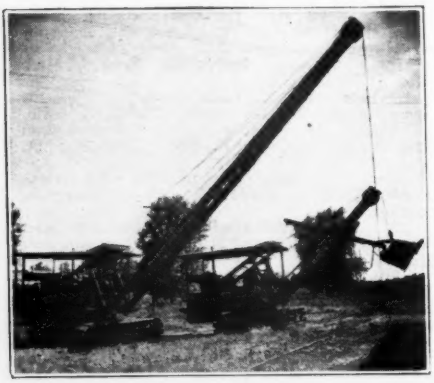
*Brownhoist Belt Conveyors, Catalog M-24*, is the latest publication issued by the Brown Hoisting Machinery Co. of Cleveland. "In all fields of industrial activity today," says the Foreword, "from the smallest sand and gravel pit to the largest manufacturing plant, continuous mechanical handling is recognized as one never-failing means of increasing production and decreasing costs."

The most successfully and widely employed equipment of this kind, of course, is the belt conveyor. This 48-page book describes the belt conveyor as it has been developed by Brownhoist engineers. It is profusely illustrated with engravings of conveyor equipment, and large installations of the same.

## New Michigan Model R Crane

In order to meet the requirements and demands of contractors for a sturdy, well-built, self-contained crawler crane, which is simple in design and has abundant power, the Michigan Dredge Co., Inc., has built and put out the Model R Michigan Crane, shown in the accompanying illustration.

This machine is built in two sizes, ½ and



¾ yards, the ½ yard machine having a traction surface of 7 feet 6 inches, and the ¾ yard machine 10 feet 6 inches in length. The all-round usefulness of this crane is said to be its best recommendation, coupled with low cost as compared with bigger machines. It is offered as a time and money-saver in handling sand, gravel, coal, and in construction work and road work.

## Webster Issues New Equipment Catalog

**General Catalog No. 48**, entitled "Webster Equipment for the Mechanical Handling of Materials," just issued by The Webster Mfg. Company of Chicago, is a splendid volume of 700 pages, containing hundreds of engravings illustrating the long line of elevating, conveying and power-transmitting machinery manufactured by this company.

The principal products discussed are Webster Elevating and Conveying Equipment, such as continuous bucket elevators and buckets, continuous belt conveyors, screw conveyors, pulleys and chain equipment, cotton, rubber and leatner belting, cast iron gearing, rope transmission, American System Rope Drives, wire rope, steel boxes for screw conveyors, screw conveyor hangers and box ends, elevator boots, barrel and sack elevators, troughing carriers, combination carriers, automatic trippers, belt loading hoppers, telescoping distributing spouts, bin bottoms, scale hopper bottoms, special spouts, bin gates, man holes, Clark-Beatty Automatic Power Shovels, car pullers, steel apron-conveyors, open top carriers, platform conveyors, track hoppers and feeders, many pages of pivoted bucket carriers, skip hoists, traveling weigh larries, gravity discharge elevator-conveyors, flight conveyors, rotary screens, sand and gravel plants, stone and rock crushing plants, Lehr conveyors, locomotive coaling stations, rotary mine car dumps, dump hoppers and feeders, shaker screens, loading booms, and loading boom hoists, car loading chute, railroad car retarder, power transmitting machinery and shafting, couplings, bearings, pillow blocks of the various kinds. Webster chains occupy 60 pages and the styles made run into the hundreds. Sprocket and traction wheels occupy 24 pages.

## P & H Acquire a Large Steel Foundry

The Pawling & Harnischfeger Company of Milwaukee, who are celebrating their fortieth year in the manufacture and sale of crane and excavating machinery, announce the addition to their equipment of a large steel foundry. This foundry was formerly operated by the Hercules Steel Casting Company for commercial production, but is now entirely devoted to the steel castings needed in the production of P & H machines.

When operating two shifts this foundry will have a capacity of 400 tons of carbon steel and alloy steel castings—the amount used each month in P & H production. It is equipped with a 10-ton electric, acid lined furnace, and two 10-ton overhead electric traveling P & H Cranes handle the ladles and heavy castings. Baking ovens for dry sand molds, sand screens and grinders, with a special belt conveying system for handling sand is also used in conjunction with the molding floor.

The core making department is equipped with two large oil-fired furnaces and a small gas-fired furnace, and a 3-ton P & H electric hoist handles the heavy cores and oven pans. The storage yard is equipped with a P & H Model 206 Corduroy Crane for heavy materials. A pattern and carpenter shop, pattern storage shed, chemical and physical laboratory are run in conjunction with the foundry.

P. H. Sacket of 3445 Hennepin Ave., Minneapolis, has been appointed to represent the company in Minnesota, North and South Dakota.

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J. S. Vrabek, formerly and for seven years Western sales manager of the Sturtevant Mill Company, has been appointed sales manager of the McGann Manufacturing Company with headquarters at 50 Church St., New York City. Before his Sturtevant connection Mr. Vrabek was with the sales and engineering department of the Allis-Chalmers Mfg. Company, and later with Vrabek and Kessler, engineers. Upon the withdrawal of Mr. Kessler, Mr. Vrabek joined the McGann Company, as sales manager.

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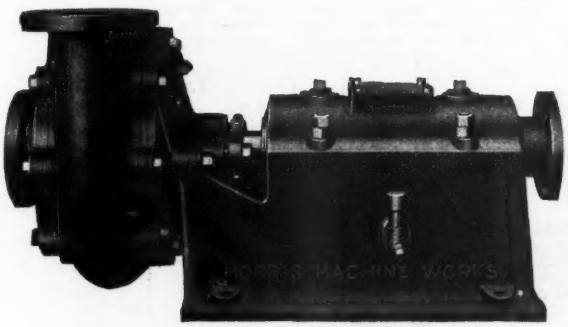
## New Farrel Gear Catalog

*Sykes Gears* is the title of the new catalog issued by the Farrel Foundry and Machine Co., Inc., of Buffalo, N. Y. This book, containing 64 pages illustrated with numerous engravings, discusses the superiority of Sykes Generated Double Helical Gears with continuous teeth.

The old method of making double helical gears was by casting and these are still often seen doing good work (but when gear cutting machines for straight tooth spur gears became generally available, the advantages of the helical principal was offset to some extent by the greater accuracy of straight tooth machine cut spur gears). The only method of devising machines for cutting double helical gears has been the hobbing process recently developed, which is awkward because it necessitates many objectionable compromises and limitations. After years of research, says the Farrel Company, a method has been perfected and double helical gears, "in every way as near perfect as possible," are being produced in large numbers.

The book describes with illustrations drive gear for various equipments, Standard Single Reduction and Standard Double Reduction, Totally Enclosed Gear-Drive Units, Special Single, Triple and Multiple Speed Charge Gear Boxes and High Speed Units. There are also many pages of technical data condensed into the form of tables and charts on the subject of gearing in general, and on our SYKES Generated Double Helical Gears with Continuous Teeth in particular.

# For hydraulic production and handling of sand, gravel, crushed rock, etc.




With countless records upon which to base design under any conditions, with every high-grade modern production facility, and with the reputation for standing squarely back of everything it builds, this company should be the first consulted on problems involving hydraulic production and handling.

Morris Centrifugal Pumps have made good in installations for leading commercial producers everywhere.

Inasmuch as efficiency, economy and long life of lining and infillers are dependent upon so many factors, and these factors influence each other, every important installation should be a matter of individual engineering.

Producers of building material who have special demands or who wish to assure themselves that their needs will be met fully and under most favorable conditions, should therefore take advantage of our engineering co-operation.

Preliminary suggestions and data on performance and costs will be furnished without charge, and gladly.

Write at least for our Bulletin 20

## Morris Machine Works Baldwinsville, N. Y.

**Originators of Centrifugal pumps, both single and multi-stage, and builders for practically all purposes since 1864**

Branch offices: New York, 39-41 Cortlandt St.; Philadelphia, Forest Bldg.; Cleveland Engineers' Bldg.; Chicago, 217 N. Jefferson St.; Boston, 79 Milk St.; Pittsburgh, 320 Second Ave.; Detroit, Penobscot Bldg.; Charlotte, Realty Bldg.; Houston, 119 Main St. Sales Representatives: Buffalo, St. Paul, Kansas City, Denver, Salt Lake City, Seattle, Portland, Ore.; Los Angeles, New Orleans. Canadian Representatives: Storey Pump & Equipment Co., Toronto.

# MORRIS
## CENTRIFUGAL PUMPS

## Wood Drill Hammers

An improvement in their Hammer Drills is reported by the Wood Drill Works of Paterson, N. J., which, they say, greatly increases the speed and drilling ability of the machine. Wood Rock Drills are described as having ease of operation, rapid drilling, long life and simplicity of adjustment.

These machines have the positive balanced spool valve, the cylinders and chests are made of vanadium Tungston iron, the longest wearing iron known. The rotators, rotator collars, pawl holder, spiral bar and washers are made of a tough grade of carbon steel. Wood Drills are made in two sizes—No. 1 for holes 3 to 6 ft., No. 2 for holes 10 to 12 ft.

Wood Piston Drills are said to be the lightest and strongest tripod drills made. The patented front head and packing gland are described as keeping the cost of repairs on front heads exceedingly low, for in the Wood Drill when the gland wears out it is only necessary to get a new gland, whereas some

drills require a new head and a new sleeve, making the replacement more expensive.

The Wood Tripod Drills are made in seven sizes, the smallest having a capacity of seven feet and the largest 50 feet.

Wood Hose Coupling and mender is recommended to road builders and contractors. Every part is made of bronze with the exception of the clamps, of malleable iron. They are interchangeable, rust-proof, and "cannot blow off or be pulled off." When tested at a pressure of 700 pounds the hose burst but the coupling held perfectly. Being rust-proof they obviate all loss of time in changing. Literature mailed on request.

## Taylor-Wharton Celebration

An unusual celebration of employers and employees was recently held by the Taylor-Wharton Iron & Steel Co. of High Bridge, N. J., in honor of the Company's Service Employees. There was music and speeches by officers of the company and presentation of cane and medals by President Percival Chrystie.

The big feature brought out was the fact that there are employed at the High Bridge plant at present five "Three Generation" families, in which father, son and grandson have given their best to the company. There are 221 employees who have served fifteen years or more; 91 who have served a quarter of a century or more; 30 who have served thirty-five years; 13 who have served forty-five years; and 11 who have served half a century.

*Bulletin No.* 1461 deals with the Superior McCully Fine Reduction Gyratory Crusher, manufactured by Allis-Chalmers Mfg. Co., Milwaukee, Wis., designed for reducing hard rock, iron ore, etc., is made in two sizes, No. 6 and No. 10. No. 6, with feed openings size 6 by 40 inches, has capacity of from 24 to 48 tons per hour according to size of discharge opening used; No. 10, with feed opening size 10 by 52 inches, has capacity of from 80 to 135 tons per hour.

*Atlas Blasting Supplies*, a new folder issued by the Atlas Powder Co., Wilmington, Del., discusses "The Advantages of Using Atlas Supplies," with engravings.

## Williamsport Wire Opens New Warehouse

Williamsport Wire Rope Company announces a further expansion of their warehouse facilities by the addition of a large stock at Cromwell, Okla., to accommodate the Oil Trade in that territory. During the past year there has been a phenomenal growth of Williamsport warehouses due to the increased demand for Williamsport Telfax Tape Marked and Certified wire lines, which has been backed by a very liberal advertising and sales campaign.

## Take Schulthess Agency

The rights for the manufacture and sale of the patent Schulthess Continuous Hydrator for the United States, Canada, Cuba, Porto Rico and South America have been secured by the McGann Manufacturing Company, Inc., of York, Pennsylvania. The patents for this hydrator are owned by Spoerri & Co., Zurich, Switzerland.

The machine, as its name implies, is a continuous automatic hydrator, and is made in six sizes—5, 10, 15, 20, 30 and 50 tons per 10 hour day. It is described as being known and used all over the world.

One of the principal features of this machine is its low power consumption. In the process of hydration the lime as it comes from the kiln without crushing is fed into the hydrator. The dry slaking method used avoids the excessive production of dust which is so prevalent with the hydrators. It is continuous in operation and completely automatic. The Schulthess Patent Condenser with which each hydrator is equipped eliminates entirely the escape of lime dust, the superfine lime, usually lost, being thus entirely controlled and saved. The hydrator is said to use less power per ton than any other method.

## Rix Products

*Labor Saving Equipment* is the title of a 4-page folder describing RIX PRODUCTS, which include the Rix Fordson Hauler, Rix Fordson Hoist, and the Rix Fordson Digger.

The Rix Fordson Digger consists of a bucket or dipper mounted on dipper stick, carried on a heavy structural steel framework mounted on a Ford truck. The action is similar to that of a steam shovel except that the structural steel boom is stationary, directly over the tractor. All parts are substantial.

The Rix Fordson Hoist is designed to fit the Fordson Tractor without drilling holes or altering its mechanical construction. It has a Ballast Box constructed in rear framework which, loaded, places the maximum lifting weight onto the rear or driving axle of the Fordson Tractor. The Rix Hauler is for use with Fordson Tractor and Motor Trucks, at their high speeds, and is of rugged construction. The Rix Products Company is located at Milwaukee, Wis.

The Pennsylvania Pump & Compressor Company of Easton, Pa., announces that the Kilner-Mills Company, General Motors Building, Detroit, Mich., is their representative for the state of Michigan and the Northwestern section of Ohio. The products of the Pennsylvania Pump & Compressor Company through this agency are the Pennsylvania air compressors, both single and double stage types, and include direct connected gasoline driven portable compressors. The pumps handled are the centrifugal double suction single stage, multi-stage and a portable known as the Penway pumper.

End